LINEAR & ROTARY ACTUATOR INSTALLATION, OPERATION AND SERVICE MANUAL

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Warranty and Limitation of Liability

EXLAR warrants its product(s) to the original purchaser and in the case of original equipment manufacturers, to their original customer to be free from defect in material and workmanship and to be made in accordance with Exlar's specifications for the product(s) as published at the time of purchase unless otherwise agreed to in writing by an authorized Exlar representative. In no event shall EXLAR be liable or have any responsibility under such warranty if the products have been improperly stored, installed, used or maintained, or if Buyer has permitted any unauthorized modifications, adjustments and/or repairs to such product(s).

Seller's obligation hereunder is limited solely to repairing or replacing (at its option), at the factory, any product(s), or parts thereof, which prove to Seller's satisfaction to be defective materials or workmanship, and within the period of time in accordance with the seller's stated product warranty (see terms and conditions), however, that written notice of claimed defects shall have been given to EXLAR within 30 days from the date any such defect is first discovered. The product(s) or part(s) claimed to be defective must be returned to EXLAR, transportation prepaid by Buyer, with written specification of the claimed defect.

Components such as seals, wipers, bearings, bushings, splines and roller screw parts are considered wear parts and must be inspected and serviced on a regular basis. Any damage caused by failure to properly lubricate EXLAR products and/or to replace wear parts at appropriate times is not covered by this warranty.

Costs for shipment of units returned to the factory for warranty repairs are the responsibility of the customer. Exlar will return ship all warranty repairs or replacements via UPS Ground at no cost to the customer.

For international customers, Exlar will return ship warranty repairs or replacements via UPS Expedited Service and cover the associated shipping costs. Any VAT or local country taxes are the responsibility of the customer.

The foregoing warranty is in lieu or all other warranties (except as Title), whether expressed or implied, including without limitation, any warranty of merchantability, or of fitness for any particular purpose, other than as expressly set forth and to the extent specified herein, and is in lieu of all other obligations or liabilities on the part of Exlar.

Seller's maximum liability with respect to these terms and conditions and any resulting sale, arising from any cause whatsoever, including without limitation, breach of contract or negligence, shall not exceed the price specified herein of the product(s), giving rise to the claim, and in no event shall EXLAR be liable under the terms of the warranty otherwise for special, incidental or consequential losses resulting from inability to use the product(s), increased operating cost, loss of production, loss of special incidental or consequential damages, whether similar or dissimilar of any nature arising or resulting from the purchase, installation, removal, repair, operation, use or breakdown of the product(s), or any other cause whatsoever including negligence.

The foregoing warranty shall apply to products or parts that have been repaired or replaced pursuant to such warranty, and within the period of time, in accordance with the Seller's stated warranty.

No person, including any agent of EXLAR, is authorized to make any representation of warranty on behalf of EXLAR concerning any products manufactured by EXLAR, except to refer to this warranty.

Safety Considerations

As with any electro-mechanical device, safety must be considered during the installation and operation of your Tritex Series actuator. Throughout this manual you will see paragraphs marked with CAUTION and WARNING signs as shown below

WARNING

"Warning" indicates the information following is essential to avoiding a safety hazard.

CAUTION

"Caution" indicates the information following is necessary for avoiding a risk of damage to the product or other equipment.

General

WARNING

Failure to follow safe installation guidelines can cause death or serious injury. The voltages used in the product can cause severe electric shock and/or burns and could be lethal. Extreme care is necessary at all times when working with or adjacent to the product. The installation must comply with all relevant safety legislation in the country of use. The forces created by actuator could be lethal or cause severe injury if proper protection is not provided to keep personnel away from moving components.

System Design and safety for personnel

WARNING

The actuator is intended as a component for professional incorporation into complete equipment or a system. If installed incorrectly, the actuator may present a safety hazard. The actuator uses high voltages and currents, carries a high level of stored electrical energy, and is used to control equipment which can cause injury. Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this manual carefully. **None of the functions or features of the Tritex actuator may be used to ensure safety of personnel, i.e. they must not be used for safety-related functions.** Careful consideration must be given to the functions of the actuator which might result in a hazard, either through their intended behavior or through incorrect operation due to a fault. In any application where a malfunction of the actuator or its control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk- for example a failsafe brake in case of loss of actuator braking power.

WARNING

Never attempt to connect or disconnect the actuator with power applied. Dangerous voltages are present. Damage to equipment and injury to personnel can result. Many amplifiers have voltage present for a considerable time period after incoming power is removed. Take care to insure that the amplifier has discharged all power.

WARNING

In a domestic environment this product may cause radio interference, in which case supplementary mitigation measures may be required.

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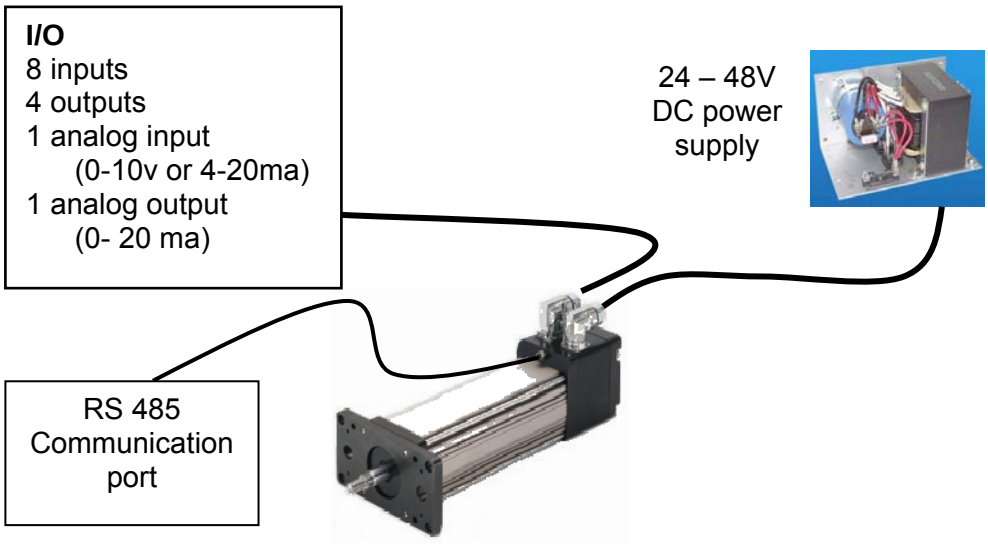
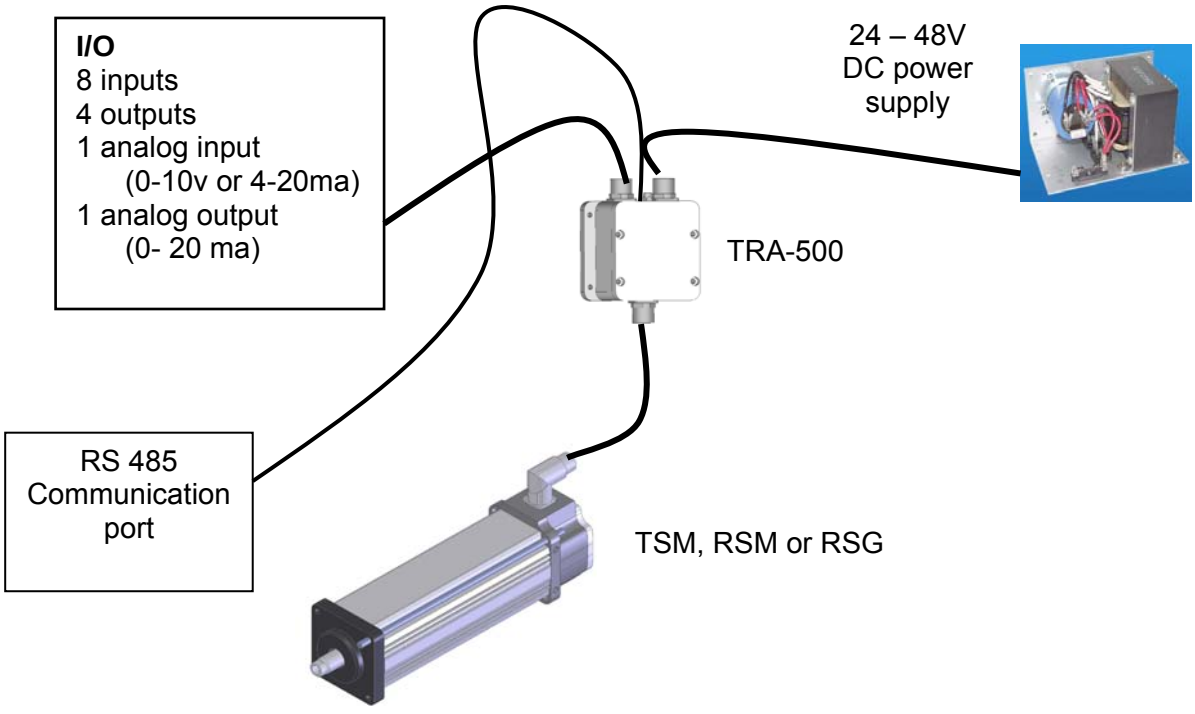
Tritex™ Product Overview

The Exlar Tritex Series of electric actuators combines an integrated brushless servo motor, amplifier and motion controller. Optionally the system can be configured for remote mounting of the amplifier and motion control



Integrated actuator, servo motor, amplifier and motion control

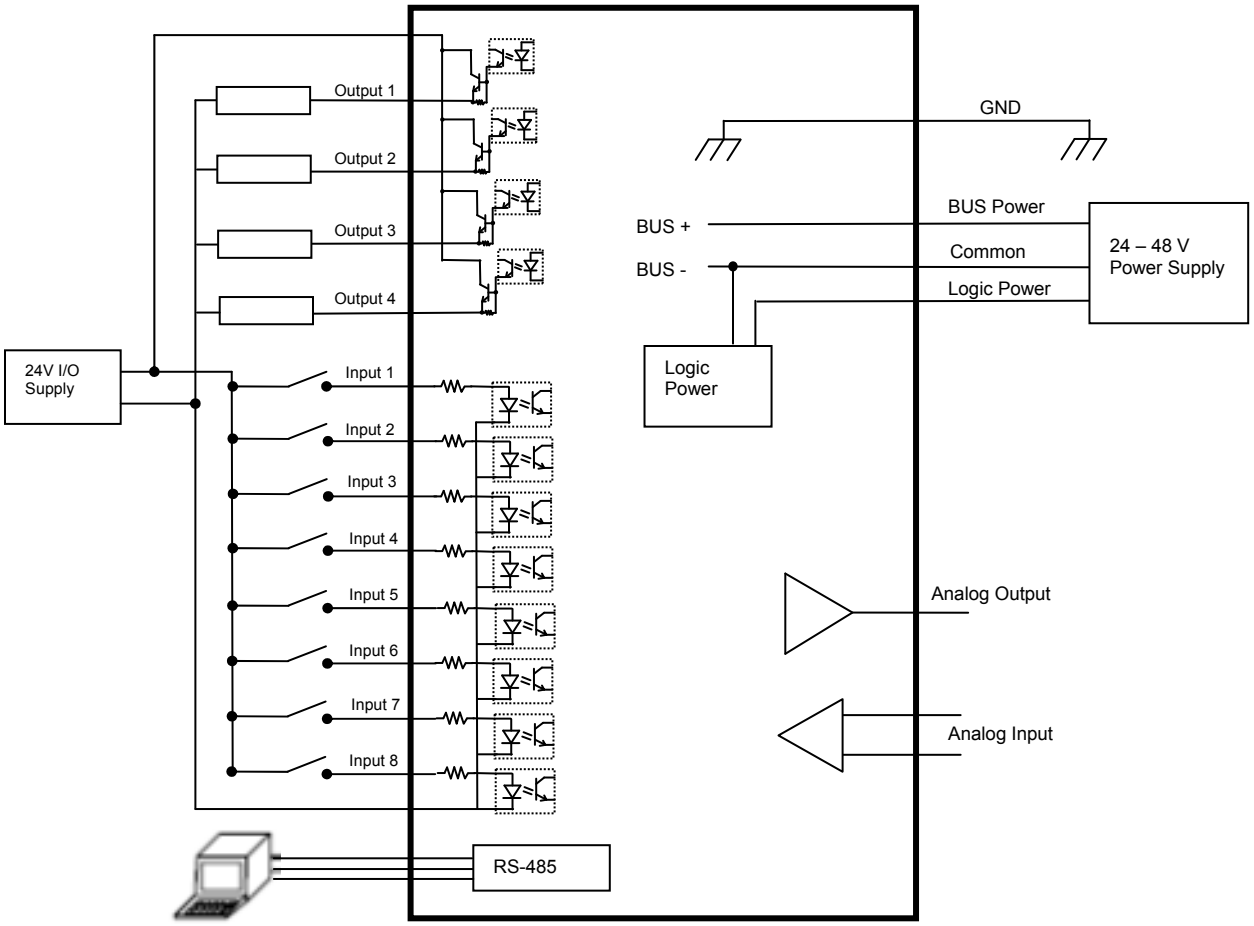


Integrated actuator and servo motor with remote drive amplifier and motion control

The Tritex actuators are available in linear and rotary versions with integrated or remote amplifier and motion control. The Remote amplifier and motion control models would typically be used in application where space at the actuator is limited or in applications with high ambient temperatures.

Actuator Models Numbers		
With Integrated amplifier & motion control	**Remote mount amplifier and motion control TRA500-x**	**Size and type**
TLM20-(see model mask)	TSM-20-(see model mask)	2 inch linear actuator
TLM30-(see model mask)	TSM-30-(see model mask)	3 inch linear actuator
RTM60-(see model mask)	RSM-60-(see model mask)	60 mm motor
RTG60-(see model mask)	RSG-60-(see model mask)	60 mm gear motor
RTM90-(see model mask)	RSM-90-(see model mask)	90 mm motor
RTG90-(see model mask)	RSG-90-(see model mask)	90 mm gear motor

All of the required power components and motion processor are contained in the actuator or remote housing.



General Specifications

Drive Specification for all Tritex Models with embedded drives

Embedded Drive Specifications	
Input Voltage, Bus and Logic	24-48 Volts DC nominal, 20 -60 Volts continuous operating range. Under voltage trip 19V, Over voltage trip 85V
I/O Power Supply	24V nominal, 30V max, 12V min
Digital Inputs	8 – opto- isolated, 24V nominal 30V max, programmable functions
Digital Outputs	4 – opto- isolated 50 mA continuous, short circuit protected, programmable functions
Analog Input	0-10 Volts or 0-20 mA, differential input 12 bit resolution, programmable as position, velocity or torque command
Analog Output	0-20 mA, 11 bit resolution, programmable functions
Serial Interface	RS-485, Modbus RTU protocol, max baud rate 38.4k
Commutation	Sinusoidal, 15kHz PWM
Resolution	0.001 revolution
Accuracy	+ / - 0.005 revolution
Output Current	Continuous and peak output current is dependent on actuator
Environmental	Ambient Temperature for rated output: 25° C Maximum Operating temperature range 0° – 55° C Power De-rating of 2.5% per degree C between 25° C and 55° C Humidity: 10 to 95% non-condensing
EMC	IEC/EN 61800-3:2004-08 with use of shielded cables and EFT/B & Surge Filter 37263 (see Accessories section) or similar

Drive specifications for TRA500 remote option

TRA500 Remote Drive Specifications						
Input Voltage, Bus and Logic	24-48 Volts DC nominal, 20 -60 Volts continuous operating range. Under voltage trip 19V, Over voltage trip 85V					
I/O Power Supply	24V nominal, 30V max, 12V min					
Digital Inputs	8 – opto- isolated, 24V nominal 30V max, programmable functions					
Digital Outputs	4 – opto- isolated 50 mA continuous, 24V nominal 30V max, short circuit protected, programmable functions					
Analog Input	0-10 Volts or 0-20 mA, differential input 12 bit resolution, programmable as position, velocity or torque command					
Analog Output	0-20 mA, 11 bit resolution, programmable functions					
Serial Interface	RS-485, Modbus RTU protocol, max baud rate 38.4k					
Commutation	Sinusoidal, 15kHz PWM					
Feedback	Analog Hall					
Continuous Output Current (Peak of sine Amps)*	25° C Ambient		40° C Ambient		55° C Ambient	
	Stall	Rated	Stall	Rated	Stall	Rated
	15	15	14	12	12	8.5
Peak Output Current (Peak of sine Amps)	20					
Environmental	IP65, Humidity: 10 to 95%, non-condensing					
*Actual output current may be reduced if the motor/actuator continuous and peak current ratings are lower						

Specifications: Size 20 Linear Actuators

TLM20

TLM series includes embedded drive and motion controller.

TLM 20 LINEAR ACTUATOR PERFORMANCE SPECIFICATIONS					
Backlash		in (mm)	.008 (.20)		
Lead Accuracy		in/ft (mm/300 mm)	.001 (.025)		
Maximum Radial Load		lb (N)	15 (67)		
Environmental Rating			**IP54**		
		Stator	**1 Stack 1B8-50**	**2 Stack 2B8-34**	**3 Stack 3B8-25**
Lead		**RPM at 48 VDC***	**5000**	**3400**	**2500**
0.1	**Stall Force**	lbf *(N)*	239 *(1063)*	377 *(1677)*	503 *(2237)*
	Max Speed	in/sec *(mm/sec)*	8.33 *(212)*	5.66 *(144)*	4.17 *(2237)*
0.2	**Stall Force**	lbf *(N)*	119 *(529)*	188 *(836)*	251 *(1117)*
	Max Speed	in/sec *(mm/sec)*	16.66 *(424)*	11.33 *(288)*	8.33 *(212)*
0.4	**Stall Force**	lbf (N)	60 *(267)*	94 *(418)*	126 *(560)*
	Max Speed	in/sec *(mm/sec)*	33.33 *(848)*	22.66 *(575)*	16.66 *(424)*
Power Supply Current Draw at Rated Power (48V)		Amps	10	10	10
Resolution		0.001 revolutions x lead			
Accuracy (not including backlash)		+/- 0.005 revolutions x lead			
Stroke Length in *(mm)*		3 *(75)*	6 *(150)*	10 *(254)*	12 *(300)*
Approximate Weight lb *(kg)*		7 *(3.2)*	8.5 *(3.9)*	10 *(4.5)*	11.5 *(5.2)*

TSM20

TSM series requires a TRA500 remote drive and motion controller.

TSM 20 LINEAR ACTUATOR PERFORMANCE SPECIFICATIONS											
Backlash		in (mm)	.008 (.20)								
Lead Accuracy		in/ft (mm/300 mm)	.001 (.025)								
Maximum Radial Load		lb (N)	15 (67)								
Environmental Rating			**IP54**								
		Stator	**1 Stack 1B8-50**			**2 Stack 2B8-34**			**3 Stack 3B8-25**		
		RPM at 48 VDC	**5000**			**3400**			**2500**		
Lead	**Ambient Temp**	**Deg C**	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**
0.1	**Stall Force**	lbf *(N)*	295 *(1312)*	262 *(1165)*	227 *(1010)*	460 *(2046)*	411 *(1828)*	355 *(1579)*	575 *(2558)*	514 *(2286)*	445 *(1979)*
	Max Speed	in/sec (mm/sec)	8.33 (212)			5.66 (144)			4.17 (106)		
0.2	**Stall Force**	lbf *(N)*	148 *(658)*	131 *(583)*	113 *(503)*	230 *(1023)*	205 *(912)*	177 *(787)*	288 *(1281)*	257 *(1143)*	223 *(992)*
	Max Speed	in/sec (mm/sec)	16.66(424)			11.33(288)			8.33(212)		
0.4	**Stall Force**	lbf *(N)*	74 *(329)*	66 *(294)*	57 *(254)*	92 *(409)*	82 *(365)*	71 *(316)*	115 *(512)*	103 *(458)*	89 *(396)*
	Max Speed	in/sec *(mm/sec)*	33.33 *(848)*			22.66 *(575)*			16.66 *(424)*		
Power Supply Current Draw at Rated Power (48V)		Amps	10			10			10		
Resolution		0.001 revolutions x lead									
Accuracy (not including backlash)		+/- 0.005 revolutions x lead									
Stroke Length in *(mm)*		3 *(75)*	6 *(150)*			10 *(254)*			12 *(300)*		
Approximate Weight lb *(kg)*		6.5 *(2.9)*	7.0 *(3.2)*			7.5 *(3.4)*			8.0 *(3.6)*		

Specifications: Size 30 Linear Actuators

TLM30

TLM series includes embedded drive and motion controller.

TLM 30 LINEAR ACTUATOR PERFORMANCE SPECIFICATIONS						
Backlash		in (mm)	.008 (.20)			
Lead Accuracy		in/ft (mm/300 mm)	.001 (.025)			
Maximum Radial Load		lb (N)	15 (67)			
Environmental Rating			**IP54**			
		Stator	**1 Stack 1B8-20**	**2 Stack 2B8-13**	**3 Stack 3B8-10**	
Lead		**RPM at 48 VDC***	**2000**	**1300**	**1000**	
0.1	**Stall Force**	lbf *(N)*	585 *(2606)*	935 *(4159)*	1250 *(5560)*	
	Max Speed	in/sec *(mm/sec)*	3.33 *(84.6)*	2.17 *(55.1)*	1.67 *(42.4)*	
0.2	**Stall Force**	lbf (N)	293 *(1303)*	468 *(2082)*	625 *(2780)*	
	Max Speed	in/sec *(mm/sec)*	6.67 *(169.4)*	4.33 *(109.9)*	3.33 *(84.6)*	
0.5	**Stall Force**	lbf *(N)*	117 *(520)*	187 *(832)*	250 *(1112)*	
	Max Speed	in/sec *(mm/sec)*	16.67 *(423.4)*	10.83 *(275.1)*	8.33 *(211.6)*	
Power Supply Current Draw at Rated Power (48V)		Amps	10	10	10	
Resolution		0.001 revolutions x lead				
Accuracy (not including backlash)		+/- 0.005 revolutions x lead				
Stroke Length in *(mm)*		3 *(75)*	6 *(150)*	10 *(254)*	12 *(300)*	18 (450)
Approximate Weight lb *(kg)*		10 *(4.5)*	12 *(5.4)*	19.5 *(8.8)*	21 *(9.5)*	25.5 *(11.6)*

TSM30

TSM series requires a TRA500 remote drive and motion controller.

TSM 30 LINEAR ACTUATOR PERFORMANCE SPECIFICATIONS												
Backlash		in (mm)	.008 (.20)									
Lead Accuracy		in/ft (mm/300 mm)	.001 (.025)									
Maximum Radial Load		lb (N)	15 (67)									
Environmental Rating			**IP54**									
		Stator	**1 Stack 1B8-20**			**2 Stack 2B8-13**			**3 Stack 3B8-10**			
		RPM at 48 VDC*	**2000**			**1300**			**1000**			
Lead	**Amb. Temp**	**Deg C**	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**	
0.1	**Stall Force**	lbf *(N)*	756 *(3362)*	686 *(3051)*	608 *(2704)*	1201 *(5342)*	1091 *(4853)*	968 *(4306)*	1545 *(6872)*	1404 *(6245)*	1247 *(5547)*	
	Max Speed	in/sec (mm/sec)	3.33 *(84.6)*			2.17 *(55.1)*			1.67 *(42.4)*			
0.2	**Stall Force**	lbf *(N)*	378 *(1681)*	343 *(1526)*	304 *(1352)*	600 *(2669)*	545 *(2425)*	484 *(2153)*	772 *(3434)*	702 *(3123)*	623 *(2771)*	
	Max Speed	in/sec (mm/sec)	6.67 *(169.4)*			4.33 *(109.9)*			3.33 *(84.6)*			
0.5	**Stall Force**	lbf *(N)*	151 *(672)*	137 *(609)*	122 *(543)*	240 *(1068)*	218 *(970)*	194 *(862)*	309 *(1375)*	281 *(1250)*	249 *(1108)*	
	Max Speed	in/sec *(mm/sec)*	16.67 *(423.4)*			10.83 *(275.1)*			8.33 *(211.6)*			
Power Supply Current at Rated Power (48V)		Amps	15	12	10	15	12	10	15	12	10	
Resolution		0.001 revolutions x lead										
Accuracy (not including backlash)		+/- 0.005 revolutions x lead										
Stroke Length in *(mm)*		3 *(75)*	6 *(150)*			10 *(254)*			12 *(300)*		18 (450)	
Approximate Weight lb *(kg)*		9.5 *(4.3)*	11.5 *(5.2)*			19 *(8.6)*			22 *(10)*		25 *(11.3)*	

Specifications: Size 60 Motors and Gear motors

RTM060

RTM060 series includes embedded drive and motion controller.

RTM060 ROTARY MOTOR TORQUE AND SPEED RATINGS				
For output torque of RTG Gearmotors, multiply by ratio and efficiency. Please note maximum allowable output torques in the Gearmotor Mechanical Ratings table page 16.				
	Stator	**1 Stack 1B8-50**	**2 Stack 2B8-34**	**3 Stack 3B8-25**
	RPM at 48 VDC	**5000**	**3400**	**2500**
Cont. Stall Torque	lbf-in *(Nm)*	4.7 *(.53)*	7.5 *(.85)*	10 *(1.13)*
Peak Torque	lbf-in *(Nm)*	9.4 *(1.06)*	15 *(1.69)*	20 *(2.26)*
Power Supply Current Draw at Rated Power (48V)	Amps	10	10	10
Resolution	0.001 revolutions / ratio			
Accuracy (not including backlash)	+/- 0.005 revolution / ratio			

RSM060 and RSG060

RSM& RSG060 series requires a TRA500 remote drive and motion controller

RSM060 ROTARY MOTOR TORQUE AND SPEED RATINGS										
For output torque of RSG gearmotors, multiply by ratio and efficiency. Please note maximum allowable output torques in the Gearmotor Mechanical Ratings table page 16.										
	Stator	**1 Stack 1B8-50**			**2 Stack 2B8-34**			**3 Stack 3B8-25**		
	RPM at 48 VDC	**5000**			**3400**			**2500**		
Ambient Temp	Deg C	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**
Cont. Stall Torque	lbf-in *(Nm)*	5.9 *(.53)*	5.2 *(.53)*	4.5 *(.53)*	9.2 *(.85)*	8.2 *(.53)*	7.1 *(.53)*	11.4 *(1.13)*	10.2 *(.53)*	8.9 *(.53)*
Peak Torque	lbf-in *(Nm)*	9.4 *(1.06)*			15 *(1.69)*			20 *(2.26)*		
Power Supply Current Draw at Rated Power (48V)	Amps	10			10			10		
Resolution	0.001 revolutions / ratio									
Accuracy (not including backlash)	+/- 0.005 revolution / ratio									

RTM/RTG and RSM/RSG060 INERTIA				
	Stator	1 Stack	2 Stack	3 Stack
Motor Armature Inertia (+/-5%)	lb-in-sec^2 *(kg-cm^2)*	0.000237 *(0.268)*	0.000413 *(0.466)*	0.000589 *(0.665)*
Gearmotor Armature Inertia*	lb-in-sec^2 *(kg-cm^2)*	0.000226 *(0.255)*	0.000401 *(0.453)*	0.000576 *(0.651)*
*Add armature inertia to gearing inertia for total inertia.				

SIZE 60 RADIAL LOAD AND BEARING LIFE

RPM	50	100	250	500	1000
lbf *(N)*	195 *(867)*	155 *(690)*	114 *(507)*	90 *(400)*	72 *(320)*

Side load ratings shown above are for 10,000 hour bearing life at 25 mm from motor face at given rpm.

RTM60 MOTOR AND RTG090 GEARMOTOR WEIGHTS

		RTM060 Without Gears	RTG060 with 1 Stage Gearing	RTG060 with 2 Stage Gearing
1 Stack Stator	lb *(kg)*	3.0 *(1.4)*	7.5 *(3.4)*	9.3 *(4.2)*
2 Stack Stator	lb *(kg)*	4.1 *(1.9)*	8.6 *(3.9)*	10.4 *(4.7)*
3 Stack Stator	lb *(kg)*	5.2 *(2.4)*	9.7 *(4.4)*	11.5 *(5.2)*

SIZE 60 GEARMOTOR MECHANICAL RATINGS

				Output Torque at Motor Speed for 10,000 Hour Life					
		Maximum Allowable Output Torque - Set by User		1000 RPM		3000 RPM		5000 RPM	
Model	Ratio	lbf-in	*Nm*	lbf-in	*Nm*	lbf-in	*Nm*	lbf-in	*Nm*
RTG060-004	4:1	603	*(68.1)*	144	*(16.2)*	104	*(11.7)*	88	*(9.9)*
RTG060-005	5:1	522	*(58.9)*	170	*(19.2)*	125	*(14.1)*	105	*(11.9)*
RTG060-010	10:1	327	*(36.9)*	200	*(22.6)*	140	*(15.8)*	120	*(13.6)*
RTG060-016	16:1	603	*(68.1)*	224	*(25.3)*	160	*(18.1)*	136	*(15.4)*
RTG060-020	20:1	603	*(68.1)*	240	*(27.1)*	170	*(19.2)*	146	*(16.5)*
RTG060-025	25:1	522	*(58.9)*	275	*(31.1)*	200	*(22.6)*	180	*(20.3)*
RTG060-040	40:1	603	*(68.1)*	288	*(32.5)*	208	*(23.5)*	180	*(20.3)*
RTG060-050	50:1	522	*(58.9)*	340	*(38.4)*	245	*(27.7)*	210	*(23.7)*
RTG060-100	100:1	327	*(36.9)*	320	*(36.1)*	280	*(31.6)*	240	*(27.1)*

Two torque ratings for the RTG gearmotors are given in the table above. The left hand columns give the maximum (peak) allowable output torque for the indicated ratios of each size RTG gearmotor. This **is not** the rated output torque of the motor multiplied by the ratio of the reducer.

It is possible to select a configuration of the motor selection and gear ratio such that the rated motor torque, multiplied by the gear ratio exceeds these ratings. It is the responsibility of the user to ensure that the settings of the system do not allow these values to be exceeded.

The right hand columns give the output torque at the indicated speed which will result in 10,000 hour life (L10). The setup of the system will determine the actual output torque and speed.

SIZE 60 GEARING REFLECTED INERTIA

Single Reduction			Double Reduction		
Gear Stages	Lbf-in-sec^2	*(kg-cm^2)*	Gear Stages	Lbf-in-sec^2	*(kg-cm^2)*
4:1	0.0000132	*(0.0149)*	16:1	0.0000121	*(0.0137)*
5:1	0.0000087	*(0.00984)*	20:1, 25:1	0.0000080	*(0.00906)*
10:1	0.0000023	*(0.00261)*	40:1, 50:1, 100:1	0.0000021	*(0.00242)*

SIZE 60 BACKLASH AND EFFICIENCY

	Single Reduction	Double Reduction
Backlash at 1% Rated Torque	10 Arc min	13 Arc min
Efficiency	91%	86%

Specifications: Size 90 motors and Gear Motors

RTM090

RTM090 series includes embedded drive and motion controller

RTM090 ROTARY MOTOR TORQUE AND SPEED RATINGS				
For output torque of RTG Gearmotors, multiply by ratio and efficiency. Please note maximum allowable output torques in the Gearmotor Mechanical Ratings page 18.				
	Stator	**1 Stack 1B8-17**	**2 Stack 2B8-10**	**3 Stack 3B8-07**
	RPM at 48 VDC	**1700**	**1000**	**700**
Cont. Stall Torque	lbf-in *(Nm)*	19 *(2.1)*	29 *(3.3)*	45 *(5.0)*
Peak Torque	lbf-in *(Nm)*	30 *(3.4)*	50 *(5.6)*	70 *(7.9)*
Power Supply Current Draw at Rated Power (48V)	Amps	10	10	10
Resolution	0.001 revolutions / ratio			
Accuracy (not including backlash)	+/- 0.005 revolution / ratio			

RSM090 and RSG090

RSM& RSG090 series requires a TRA500 remote drive and motion controller

RSM090 ROTARY MOTOR TORQUE AND SPEED RATINGS										
For output torque of RSG gearmotors, multiply by ratio and efficiency. Please note maximum allowable output torques in the Gearmotor Mechanical Ratings able page 18.										
	Stator	**1 Stack 1B8-17**			**2 Stack 2B8-10**			**3 Stack 3B8-07**		
	RPM at 48 VDC	**1700**			**1000**			**700**		
Ambient Temp	Deg C	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**	**25°**	**40°**	**55°**
Cont. Stall Torque	lbf-in *(Nm)*	22 *(2.5)*	20 *(2.3)*	17.5 *(2.0)*	37 *(4.2)*	34 *(3.8)*	30 *(3.4)*	51 *(5.7)*	46 *(5.2)*	42 *(4.7)*
Peak Torque	lbf-in *(Nm)*	30 *(3.4)*			15 *(5.6)*			70 *(7.9)*		
Power Supply Current Draw at Rated Power (48V)	Amps	15	12	10	15	12	10	15	12	10
Resolution	0.001 revolutions / ratio									
Accuracy (not including backlash)	+/- 0.005 revolution / ratio									

RTM/RTG and RSM/RSG090 INERTIA				
	Stator	1 Stack	2 Stack	3 Stack
Motor Armature Inertia (+/-5%)	lb-in-sec^2 *(kg-cm^2)*	0.00054 *(0.609)*	0.00097 *(1.09)*	0.00140 *(1.58)*
Gearmotor Armature Inertia*	lb-in-sec^2 *(kg-cm^2)*	0.00114 *(1.29)*	0.00157 *(1.77)*	0.00200 *(2.26)*
*Add armature inertia to gearing inertia for total inertia.				

SIZE 90 RADIAL LOAD AND BEARING LIFE

RPM	50	100	250	500	1000
lbf *(N)*	389 *(1730)*	309 *(1375)*	227 *(1010)*	180 *(801)*	143 *(636)*
Side load ratings shown above are for 10,000 hour bearing life at 25mm from motor face at given rpm.					

RTM90 MOTOR AND RTG090 GEARMOTOR WEIGHTS

		RTM090 Without Gears	RTG090 with 1 Stage Gearing	RTG090 with 2 Stage Gearing
1 Stack Stator	lb *(kg)*	5.4 *(2.5)*	12.8 *(5.8)*	14.8 *(6.7)*
2 Stack Stator	lb *(kg)*	7.8 *(3.5)*	15.2 *(6.9)*	17.2 *(7.8)*
3 Stack Stator	lb *(kg)*	10.2 *(4.6)*	17.6 *(7.9)*	19.6 *(8.9)*

SIZE 90 MECHANICAL RATINGS

				Output Torque at Motor Speed for 10,000 Hour Life					
		Maximum Allowable Output Torque - Set by User		1000 RPM		1500 RPM		2000 RPM	
Model	Ratio	lbf-in	*Nm*	lbf-in	*Nm*	lbf-in	*Nm*	lbf-in	*Nm*
RTG090-004	4:1	2078	*234.8*	600	*(67.8)*	552	*(62.4)*	504	*(56.9)*
RTG090-005	5:1	1798	*203.1*	775	*(87.6)*	714	*(80.7)*	652	*(73.7)*
RTG090-010	10:1	1126	*127.2*	890	*(100.6)*	820	*(92.7)*	750	*(84.7)*
RTG090-016	16:1	2078	*234.8*	912	*(103.4)*	830	*(94.7)*	763	*(86.2)*
RTG090-020	20:1	2078	*234.8*	980	*(110.7)*	900	*(101.7)*	820	*(92.6)*
RTG090-025	25:1	1798	*203.1*	1250	*(141.2)*	1150	*(130)*	1050	*(118.6)*
RTG090-040	40:1	2078	*234.8*	1200	*(135.6)*	1107	*(125)*	1013	*(114.4)*
RTG090-050	50:1	1798	*203.1*	1550	*(169.4)*	1434	*(162)*	1317	*(148.8)*
RTG090-100	100:1	1126	*127.2*	1100	*(124.3)*	1100	*(124.3)*	1100	*(124.3)*

Two torque ratings for the RTG gearmotors are given in the table above. The left hand columns give the maximum (peak) allowable output torque for the indicated ratios of each size RTG gearmotor. This **is not** the rated output torque of the motor multiplied by the ratio of the reducer.

It is possible to select a configuration of the motor selection and gear ratio such that the rated motor torque, multiplied by the gear ratio exceeds these ratings. It is the responsibility of the user to ensure that the settings of the system do not allow these values to be exceeded.

The right hand columns give the output torque at the indicated speed which will result in 10,000 hour life (L10). The setup of the system will determine the actual output torque and speed.

SIZE 90 GEARING REFLECTED INERTIA

Single Reduction			Double Reduction		
Gear Stages	lbf-in-sec²	*(kg-cm²)*	Gear Stages	lbf-in-sec²	*(kg-cm²)*
4:1	0.000154	*(0.174)*	16:1	0.000115	*(0.130)*
5:1	0.000100	*(0.113)*	20:1, 25:1	0.0000756	*(0.0854)*
10:1	0.0000265	*(0.0300)*	40:1, 50:1, 100:1	0.0000203	*(0.0230)*

SIZE 90 BACKLASH AND EFFICIENCY

	Single Reduction	Double Reduction
Backlash at 1% Rated Torque	10 Arc min	13 Arc min
Efficiency	91%	86%

Model Mask and Ordering Information

TLM Series

TRITEX TLM SERIES ORDERING GUIDE			
AAABB-CCDD-EFG-HHH-HH - (XX…XX - #####)			
AAA = Actuator Type		**G = Rod End**	
TLM = Tritex Linear Actuator		M = Male US Std Thread	A = Male Metric
BB = Actuator Frame Size		F = Female US Std Thread	B = Female Metric
20 = 2 inch nominal frame actuator		X = Special (please specify)	
30 = 3 inch nominal frame actuator		**HHH-HH - Motor Stator**	
CC = Stroke Length		***TLM20***	
03 = 3 inch (75 mm)		1B8-50 = 1 Stack, 5000 rpm at 48 VDC, 2500 rpm at 24 VDC	
06 = 6 inch (150 mm)		2B8-34 = 2 Stack, 3400 rpm at 48 VDC, 1700 rpm at 24 VDC	
10 = 10 inch (254 mm)		3B8-25 = 3 Stack, 2500 rpm at 48 VDC, 1250 rpm at 24 VDC	
12 = 12 inch (305 mm)		***TLM30***	
18 = 18 inch (457 mm) (TLM30 only)		1B8-20 = 1 Stack, 2000 rpm at 48 VDC, 1000 rpm at 24 VDC	
DD = Lead (linear motion per screw revolution)		2B8-13 = 2 Stack, 1300 rpm at 48 VDC, 750 rpm at 24 VDC	
01 = 0.1 inch (2.54 mm)		3B8-10 = 3 Stack, 1000 rpm at 48 VDC, 500 rpm at 24 VDC (not available in 3 inch stroke)	
02 = 0.2 inch (5.08 mm)			
04 = 0.4 inch (10.16 mm) (TLM20 only)		**XX..XX = Travel and Housing Options (Multiples Possible)**	
05 = 0.5 inch (12.7 mm) (TLM30 only)		***Travel Options***	
E = Connections		AR = External Anti-rotate	L1/2/3 = External Limit Switches
I = Exlar std M23 style connector		PF = Preloaded Follower*	RB = Rear Brake (future option)
Bxx = Embedded leads, 3 ft.		XT = Special Travel Options	
Pxx = Embedded leads w/plug, std M23 style connector, 3 ft.		***Housing Options***	
X = Special (please specify)		P5 = IP65 sealed housing	
F = Mounting		***Special Motor Options***	
C = Rear Clevis	D = Double Side Mount	XL = Special Lubrication	
E = Extended Tie Rod	F - Front Flange	XM = Special Motor Option	
S = Side Mount	T = Side Trunnion	**##### = 5 digit PN assigned to designate special model number**	
M = Metric Extended Tie Rod	X = Special	Optional 5 digit assigned PN to designate unique model numbers	
* The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the std non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw.			

TSM Series, Also see TRA500 page 22

REMOTE TRITEX TSM SERIES ORDERING GUIDE			
AAABB-CCDD-EFG-HHH-HH - (XX…XX - #####)			
AAA = Actuator Type		**G = Rod End**	
TSM = Tritex Linear Actuator Used with TRA500 remote drive		M = Male US Std Thread	A = Male Metric
BB = Actuator Frame Size		F = Female US Std Thread	B = Female Metric
20 = 2 inch nominal frame actuator		X = Special (please specify)	
30 = 3 inch nominal frame actuator		**HHH-HH - Motor Stator**	
CC = Stroke Length		***TSM20***	
03 = 3 inch (75 mm)		1B8-50 = 1 Stack, 5000 rpm at 48 VDC, 2500 rpm at 24 VDC	
06 = 6 inch (150 mm)		2B8-34 = 2 Stack, 3400 rpm at 48 VDC, 1700 rpm at 24 VDC	
10 = 10 inch (254 mm)		3B8-25 = 3 Stack, 2500 rpm at 48 VDC, 1250 rpm at 24 VDC	
12 = 12 inch (305 mm)		***TSM30***	
18 = 18 inch (457 mm) (TSM30 only)		1B8-20 = 1 Stack, 2000 rpm at 48 VDC, 1000 rpm at 24 VDC	
DD = Lead (linear motion per screw revolution)		2B8-13 = 2 Stack, 1300 rpm at 48 VDC, 750 rpm at 24 VDC	
01 = 0.1 inch (2.54 mm)		3B8-10 = 3 Stack, 1000 rpm at 48 VDC, 500 rpm at 24 VDC (not available in 3 inch stroke)	
02 = 0.2 inch (5.08 mm)			
04 = 0.4 inch (10.16 mm) (TSM20 only)		**XX..XX = Travel and Housing Options (Multiples Possible)**	
05 = 0.5 inch (12.7 mm) (TSM30 only)		***Travel Options***	
E = Connections		AR = External Anti-rotate	L1/2/3 = External Limit Switches
I = Exlar std M23 style connector		PF = Preloaded Follower*	RB = Rear Brake (future option)
Pxx = Embedded leads w/plug, std M23 style connector, 3 ft.		XT = Special Travel Options	
		Housing Options	
		P5 = IP65 sealed housing	
F = Mounting		***Special Motor Options***	
C = Rear Clevis	D = Double Side Mount	XL = Special Lubrication	
E = Extended Tie Rod	F - Front Flange	XM = Special Motor Option	
S = Side Mount	T = Side Trunnion	**##### = 5 digit PN assigned to designate special model number**	
M = Metric Extended Tie Rod	X = Special	Optional 5 digit assigned PN to designate unique model numbers	
* The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the std non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw.			

RTM/RTG Series

TRITEX RTM/G SERIES ORDERING GUIDE			
AAABBB-CCC-DE-FFF-FF- (XX…XX) - #####			
AAA = Actuator Type		**E = Connector Options**	
RTM = Tritex Rotary Motor		I = Exlar Std M23 style connector	B = Embedded Leads
RTG = Tritex Rotary Gearmotor		P = Embedded leads w/plug	X = Special (please specify)
BBB = Frame Size		**FFF-FF = Motor Stators**	
060 = 60 mm		***RTM/RTG060***	
090 = 90 mm		1B8-50 = 1 Stack, 5000 rpm at 48 VDC, 2500 rpm at 24 VDC	
CCC = Gear Ratio		2B8-34 = 2 Stack, 3400 rpm at 48 VDC, 1700 rpm at 24 VDC	
Blank = RTM		3B8-25 = 3 Stack, 2500 rpm at 48 VDC, 1250 rpm at 24 VDC	
Single Reduction Ratios	***Double Reduction Ratios***	***RTM/RTG090***	
004 = 4:1	016 = 16:1	1B8-17 = 1 Stack, 1700 rpm at 48 VDC, 850 VDC at 24 VDC	
005 = 5:1	020 = 20:1	2B8-10 = 2 Stack, 1000 rpm at 48 VDC, 500 VDC at 24 VDC	
010 = 10:1	025 = 25:1	3B8-07 = 3 Stack, 700 rpm at 48 VDC, 350 VDC at 24 VDC	
	040 = 40:1	XX = Special Options	
	050 = 50:1	XH = Special Housing Options	
	100 = 100:1	XM = Special Motor Options	
D = Shaft Type		XL = Special Lubrication	
K = Keyed, R = Smooth/Round, X = Special Shaft		**##### = 5 digit PN assigned to designate special model number**	
		Optional 5 digit assigned PN to designate unique model number	

RSM/RSG Series, Also see TRA500 page 22

REMOTE TRITEX RSM/RSG SERIES ORDERING GUIDE		
AAABBB-CCC-DE-FFF-FF- (XX…XX) - #####		
AAA = Actuator Type		**E = Connector Options**
RSM = Tritex Rotary Motor Used with TRA500 remote drive		I = Exlar Std M23 style connector
RSG = Tritex Rotary Gearmotor Used with TRA500 remote drive		P = Embedded leads w/plug
BBB = Frame Size		**FFF-FF = Motor Stators**
060 = 60 mm		***RSM/RSG060***
090 = 90 mm		1B8-50 = 1 Stack, 5000 rpm at 48 VDC, 2500 rpm at 24 VDC
CCC = Gear Ratio		2B8-34 = 2 Stack, 3400 rpm at 48 VDC, 1700 rpm at 24 VDC
Blank = RTM		3B8-25 = 3 Stack, 2500 rpm at 48 VDC, 1250 rpm at 24 VDC
Single Reduction Ratios	***Double Reduction Ratios***	***RSM/RSG090***
004 = 4:1	016 = 16:1	1B8-17 = 1 Stack, 1700 rpm at 48 VDC, 850 VDC at 24 VDC
005 = 5:1	020 = 20:1	2B8-10 = 2 Stack, 1000 rpm at 48 VDC, 500 VDC at 24 VDC
010 = 10:1	025 = 25:1	3B8-07 = 3 Stack, 700 rpm at 48 VDC, 350 VDC at 24 VDC
	040 = 40:1	XX = Special Options
	050 = 50:1	XH = Special Housing Options
	100 = 100:1	XM = Special Motor Options
D = Shaft Type		XL = Special Lubrication
K = Keyed, R = Smooth/Round, X = Special Shaft		**##### = 5 digit PN assigned to designate special model number**
		Optional 5 digit assigned PN to designate unique model number

TRA500 REMOTE TRITEX DRIVE ORDERING GUIDE
AAABBB-C - #####
AAA = Drive Type
BBB = Power
500 = 500 Watts
C = Connector Options
N = ½ inch NPT Threaded Holes
G = PG Threaded Holes
I = Exlar Std M23 style connector
Bxx = Embedded leads, xx = length in feet
Pxx = Embedded leads w/ M23 Plug, xx = length in feet
= 5 digit PN assigned to designate special model number
Optional 5 digit assigned PN to designate unique model number

Installation

Mechanical Installation

Lubrication

The TLM and TSM Series actuators are shipped from the factory fully greased and ready for installation. Exlar recommends using Mobilith SHC 220, a high performance, extreme-pressure grease. The unique physical properties of the synthetic base oil provide outstanding protection against wear, rust, corrosion and high or low-temperature degradation. Mobilith SHC allows for very low starting and running torque values. Its operating range is -40 degrees C to 177 degrees C (-40 degrees F to 350 degrees F).

Mounting Configurations

The standard configurations available are Rear Clevis, Side Mount, Side Trunion and Front Flange (See Model Mask and ordering guide in Overview section). General drawings are shown in the product section guide.

Mounting and Operating Considerations

Every effort should be made to minimize misalignment. Any misalignment will decrease the life of the components within the actuator and also may create problems within the application associated with misalignment.

Excessive side load on the output rod of the actuator will dramatically reduce the life of the actuator and should be avoided completely. Side load can be caused from misalignment or loading that is not in line with the actuator output rod.

Care should be taken not to exceed the physical travel limits of TLM Series Actuators. Doing so will cause the actuator to end-crash internally. End crashes can physically damage the roller screw and the internal components of the actuator.

General Operation

The Tritex Series of actuators and motors function in the same manner as a brushless servomotor. The servo amplifier is used to rotate the motor at controlled speed and torque, and for controlled numbers of revolutions and move times. This rotary motion is translated into linear motion by the internal planetary roller screw mechanism of the TLM Series linear actuator. The rotary motion of the motor and the linear motion of the actuator correspond to the following relationships:

Linear Distance Traveled (in) = (Motor Revolutions)*(Roller Screw Lead)

Linear Speed (in/sec) = ((Motor RPM) / 60)*(Roller Screw Lead)

Linear Force (lbf) = ((Motor Torque (in-lbf))*(2π)*(efficiency)) / (Roller Screw Lead (in))
All of the above relationships require proper anti-rotation of the TLM Series actuator rod.

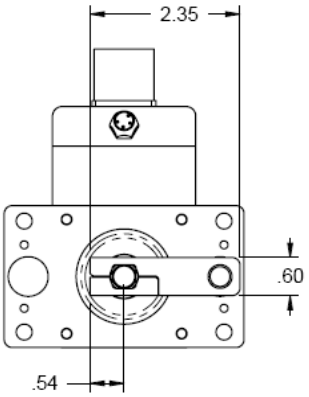
TLM & TSM Series Linear Actuator Anti-rotation Option

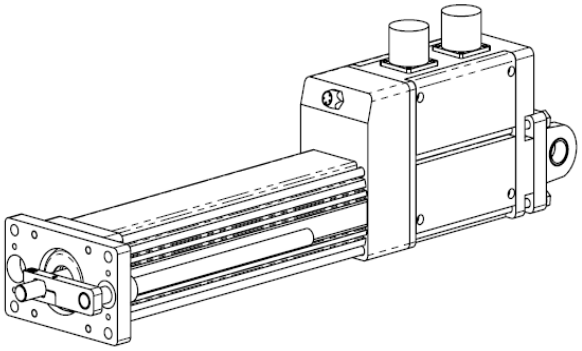
The unique design of the TLM Series linear actuators allows the extending rod to rotate. This simplifies the setup of the actuator by allowing the user to rotate the rod and thread it in and out of the actuator for mechanical attachment or system testing.

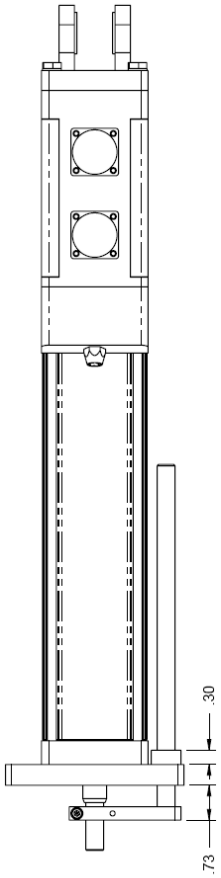
This feature also requires that the rod be kept from rotating when used in its dedicated application to insure proper linear motion. In most applications, such as those where the load is coupled to linear bearings or some other support device, the load cannot rotate, providing anti-rotation for the extending rod of the actuator.

For applications in which the load is free to rotate, Exlar offers the anti-rotation systems shown below. The drawings on the next page show the rod and bushing on only one side of the actuator. For long stroke actuators, the rod and bushing are required on both sides of the actuator.

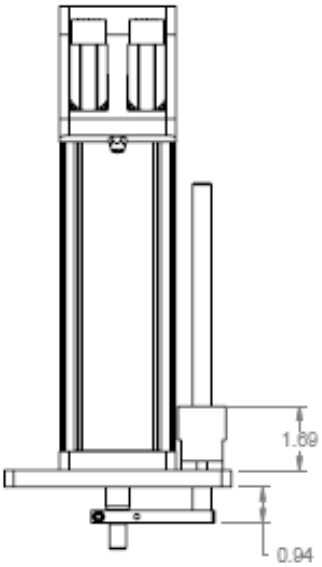
TLM/TSM Anti-Rotate

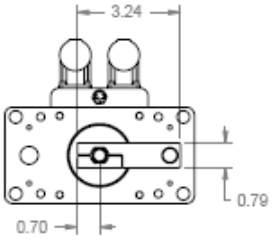


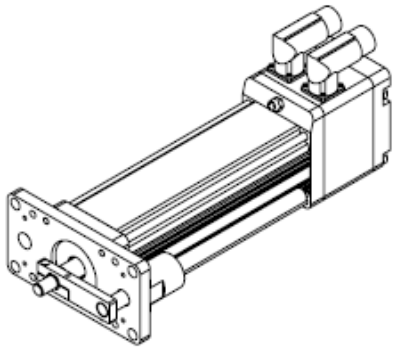




TLM/TSM20 with Anti-rotate



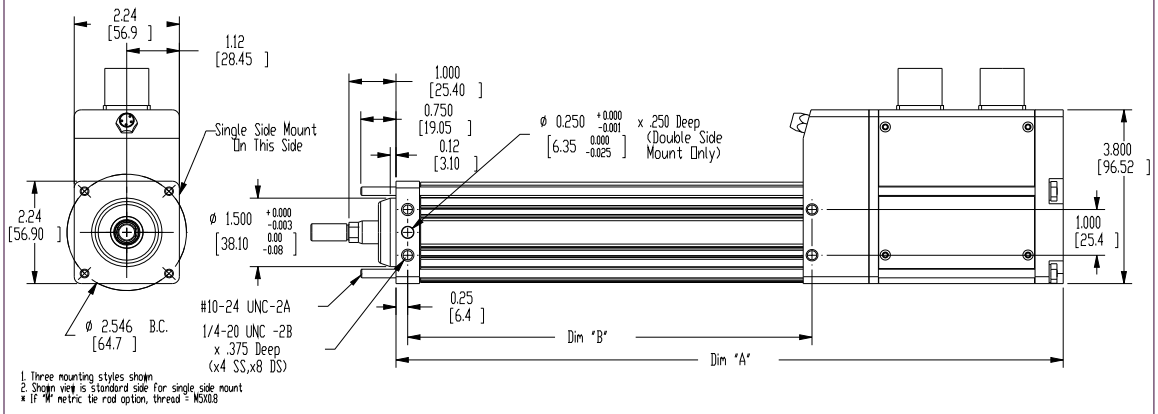




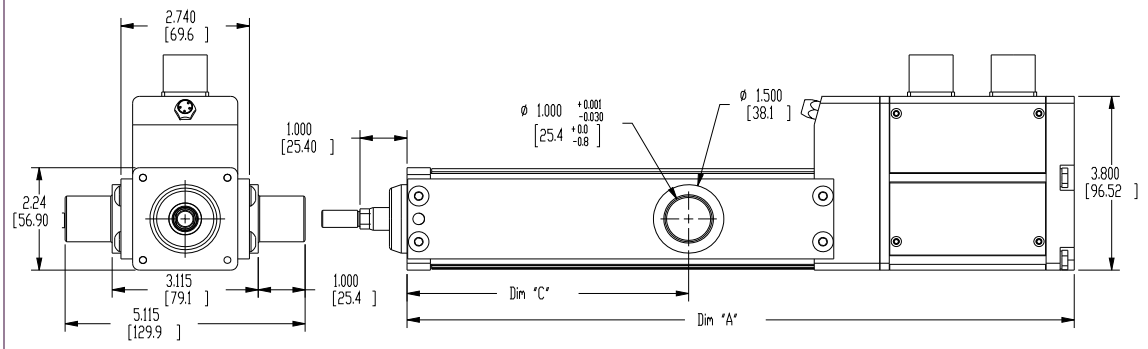
TLM/TSM 30with Anti-rotate

TLM20 Dimensions

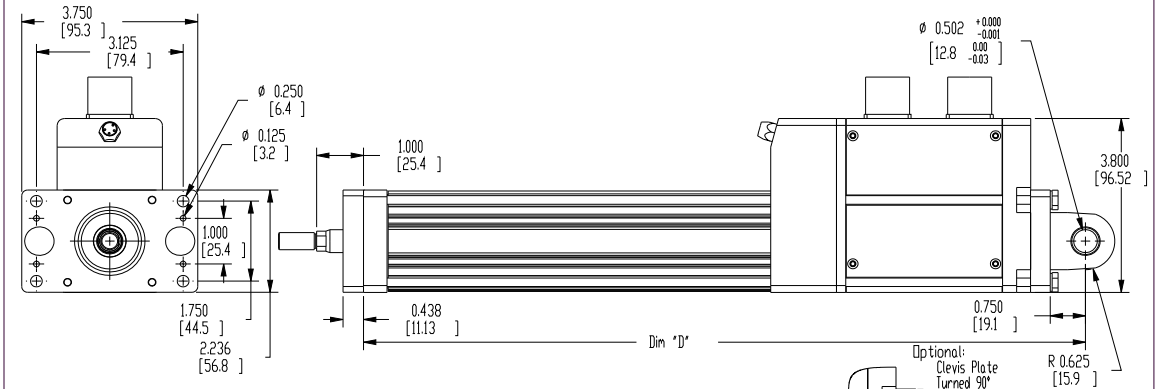
TLM20, Double Side Mounts or Extended Tie Rod Mount


2.24 [56.9]
1.12 [28.45]
1.000 [25.40]
0.750 [19.05]
0.12 [3.10]
Single Side Mount On This Side
Ø 0.250 +0.000 -0.001 [6.35 0.000 -0.025] x .250 Deep (Double Side Mount Only)
3.800 [96.52]
2.24 [56.90]
Ø 1.500 +0.000 -0.003 [38.10 0.00 -0.08]
1.000 [25.4]
#10-24 UNC-2A
1/4-20 UNC -2B x .375 Deep (x4 SS,x8 DS)
Ø 2.546 B.C. [64.7]
0.25 [6.4]
Dim "B"
Dim "A"
1. Three mounting styles shown
2. Shown view is standard side for single side mount
* If "M" metric tie rod option, thread = M5X0.8

TLM20 Side Trunnion Mount

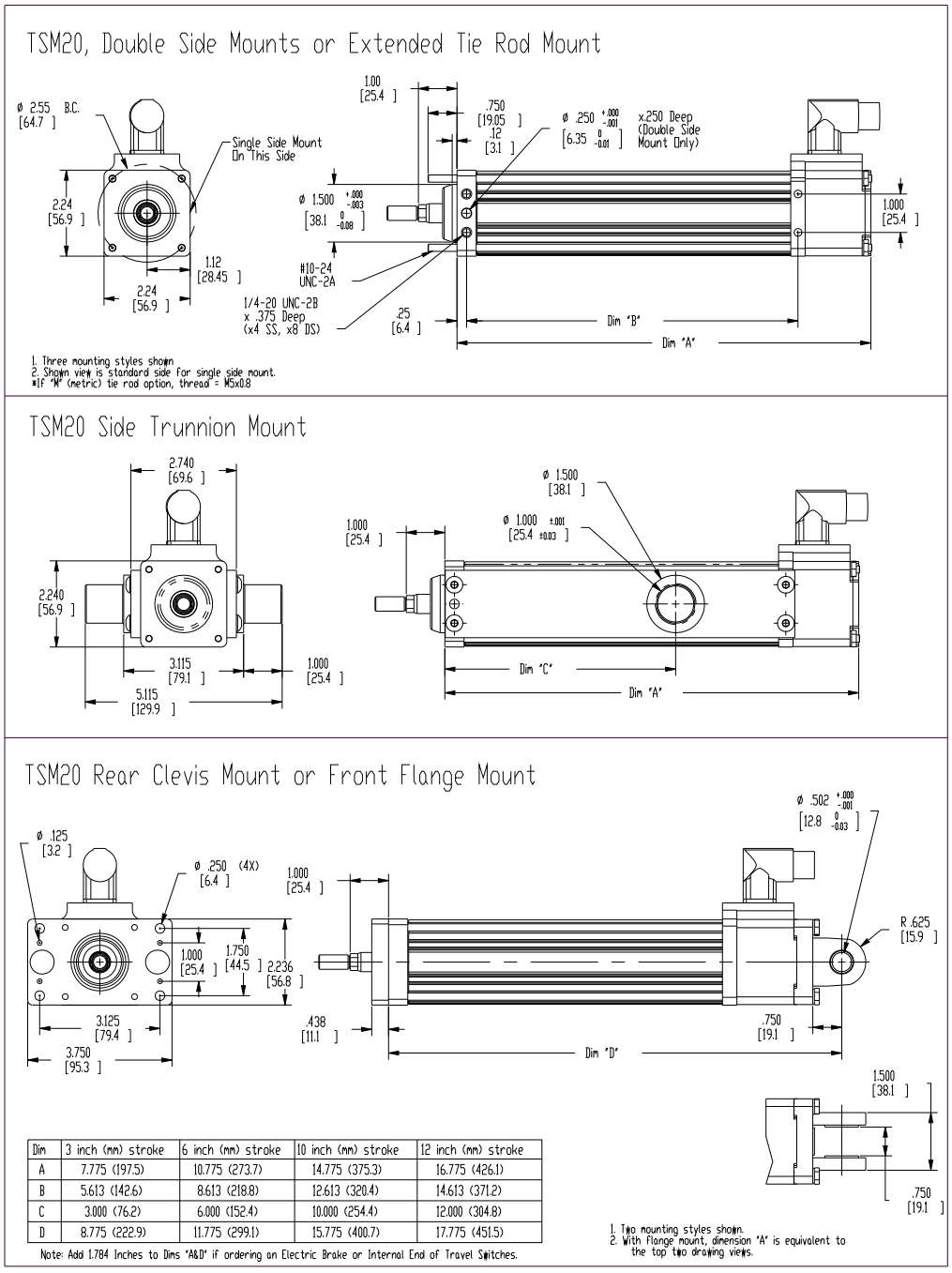


TLM20 Rear Clevis Mount or Front Flange Mount



Dim	3 inch (mm) stroke	6 inch (mm) stroke	10 inch (mm) stroke	12 inch (mm) stroke
A	11.215 (284.9)	14.215 (361.1)	18.215 (462.7)	22.215 (564.3)
B	5.613 (142.6)	8.613 (218.8)	12.613 (320.4)	14.613 (371.2)
C	3.000 (76.2)	6.000 (152.4)	10.000 (254.4)	12.000 (304.8)
D	12.422 (315.5)	15.422 (391.7)	19.422 (493.3)	21.422 (544.1)

TSM20 Dimensions

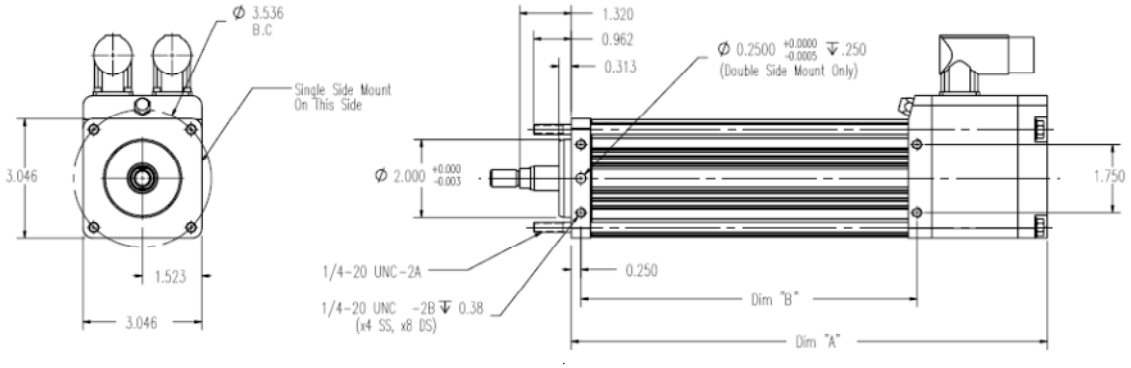


Dim	3 inch (mm) stroke	6 inch (mm) stroke	10 inch (mm) stroke	12 inch (mm) stroke
A	7.775 (197.5)	10.775 (273.7)	14.775 (375.3)	16.775 (426.1)
B	5.613 (142.6)	8.613 (218.8)	12.613 (320.4)	14.613 (371.2)
C	3.000 (76.2)	6.000 (152.4)	10.000 (254.4)	12.000 (304.8)
D	8.775 (222.9)	11.775 (299.1)	15.775 (400.7)	17.775 (451.5)

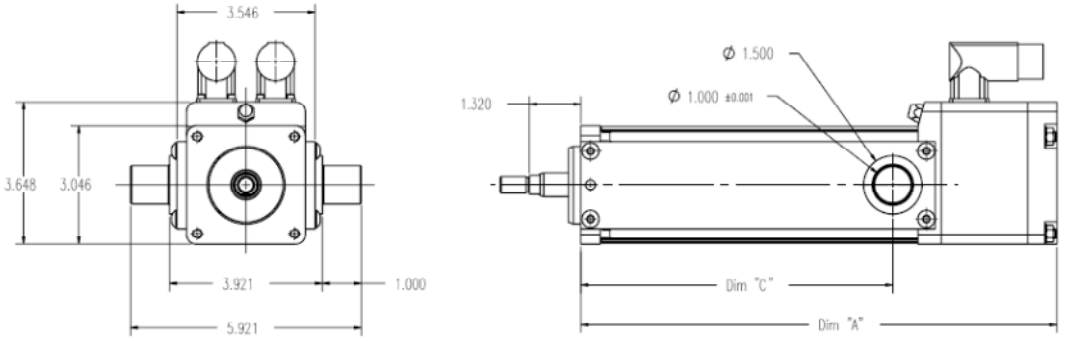
Note: Add 1.784 Inches to Dims "A&D" if ordering an Electric Brake or Internal End of Travel Switches.

TLM30 Dimensions

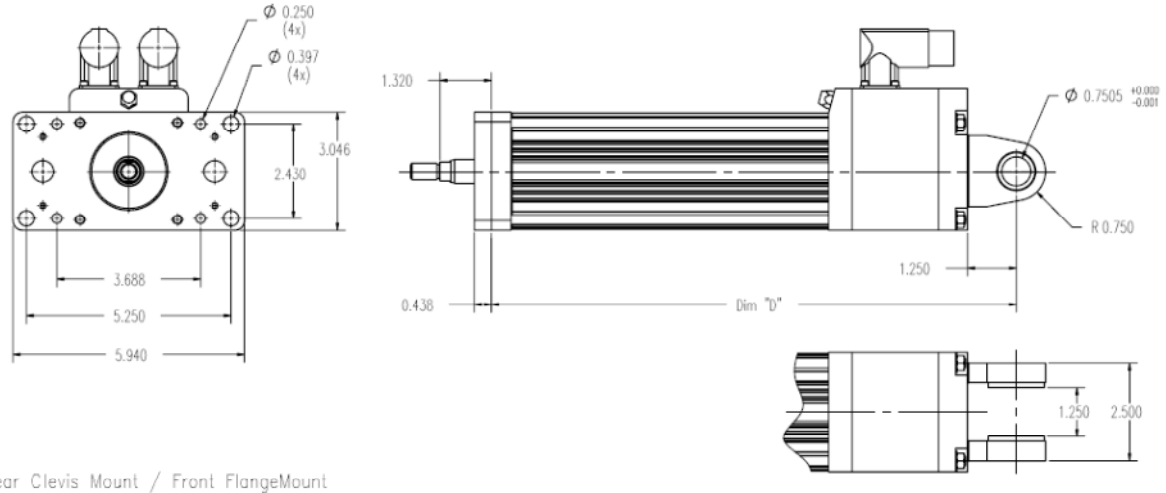
Dim	3 Inch Stroke	6 Inch Stroke	10 Inch Stroke	14 Inch Stroke	18 Inch Stroke
A	9.743	12.216	16.715	20.715	24.715
B	6.147	8.620	13.119	17.119	21.119
C	5.380	8.006	10.000	14.000	18.000
D	10.993	13.466	17.965	21.965	25.965



Single & Double Side Mounts / Extended Tie Rod Mount

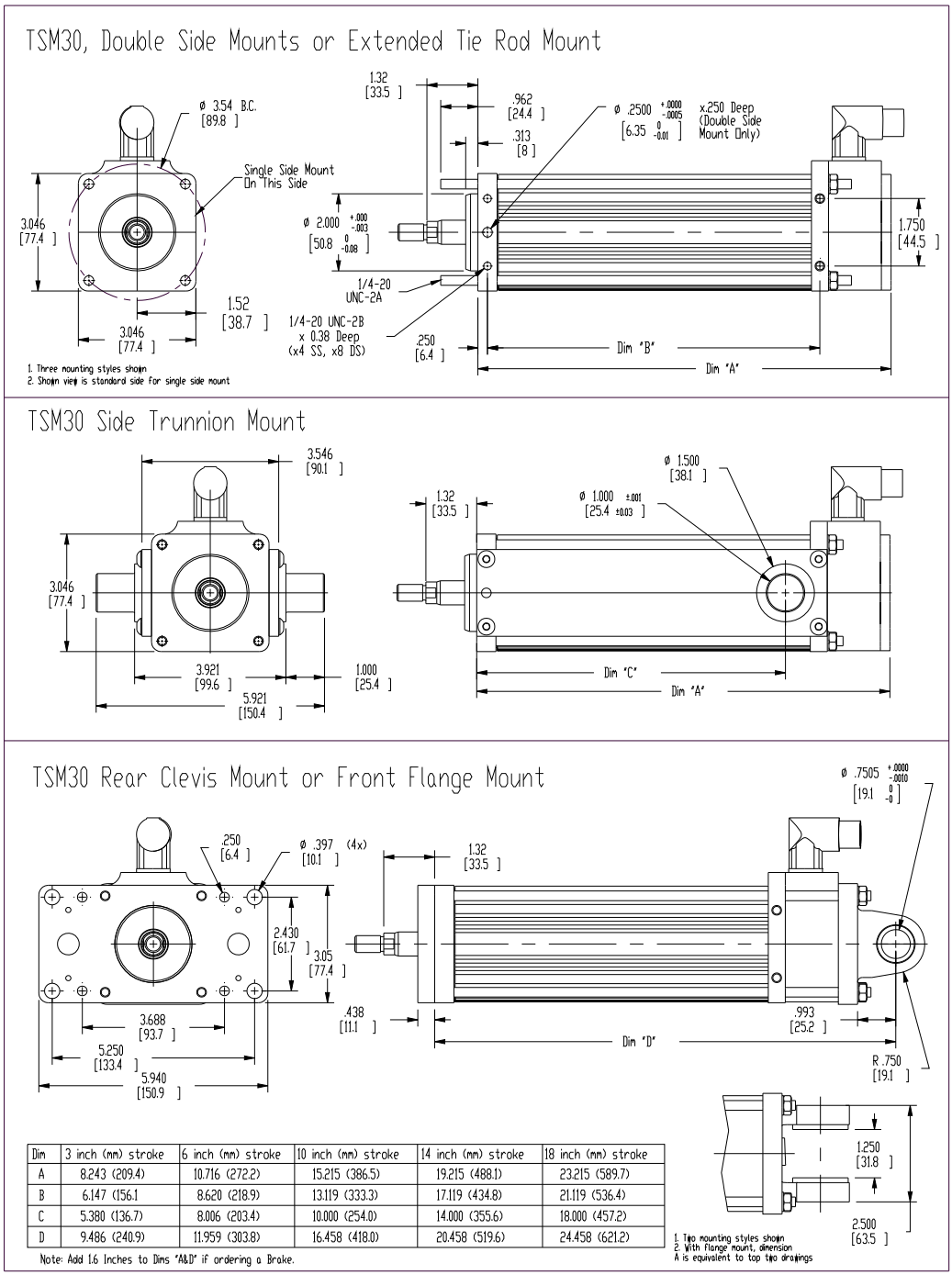


Side Trunnion Mount



Rear Clevis Mount / Front FlangeMount

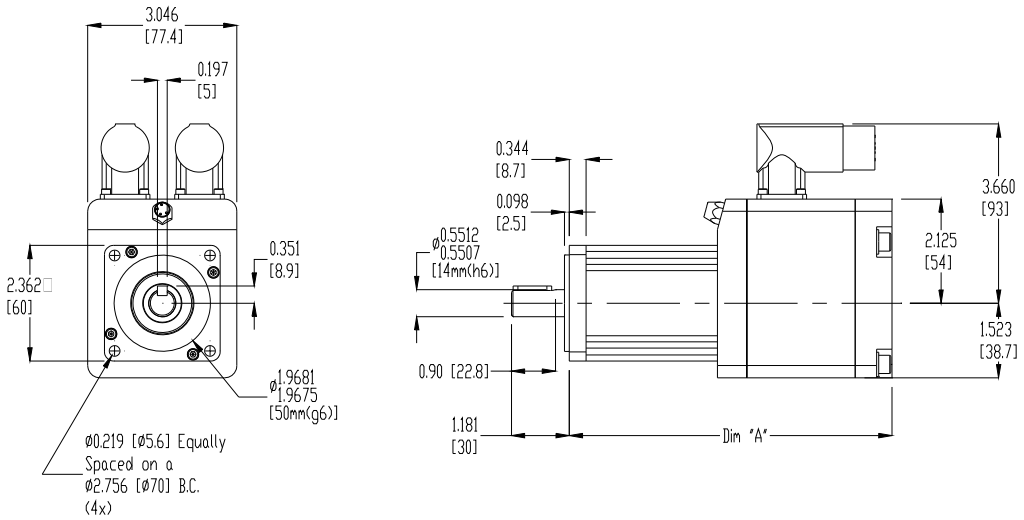
TSM30 Dimensions



Dim	3 inch (mm) stroke	6 inch (mm) stroke	10 inch (mm) stroke	14 inch (mm) stroke	18 inch (mm) stroke
A	8.243 (209.4)	10.716 (272.2)	15.215 (386.5)	19.215 (488.1)	23.215 (589.7)
B	6.147 (156.1	8.620 (218.9)	13.119 (333.3)	17.119 (434.8)	21.119 (536.4)
C	5.380 (136.7)	8.006 (203.4)	10.000 (254.0)	14.000 (355.6)	18.000 (457.2)
D	9.486 (240.9)	11.959 (303.8)	16.458 (418.0)	20.458 (519.6)	24.458 (621.2)

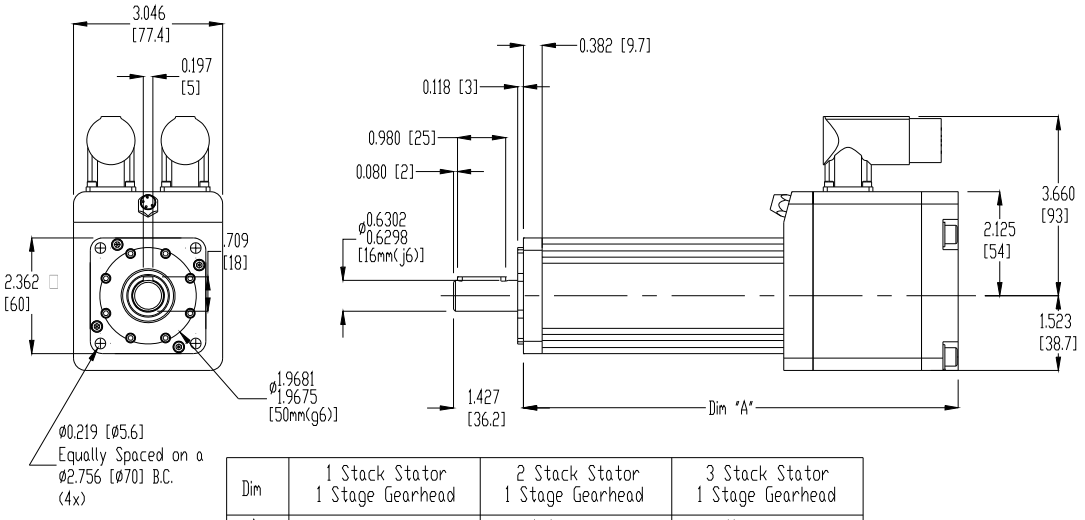
RTM060 and RTG060 Dimensions

RTM060



Dim"A"	
1 Stack, no brake	6.592 [167]
2 Stack, no brake	7.842 [199]
3 Stack, no brake	9.092 [231]

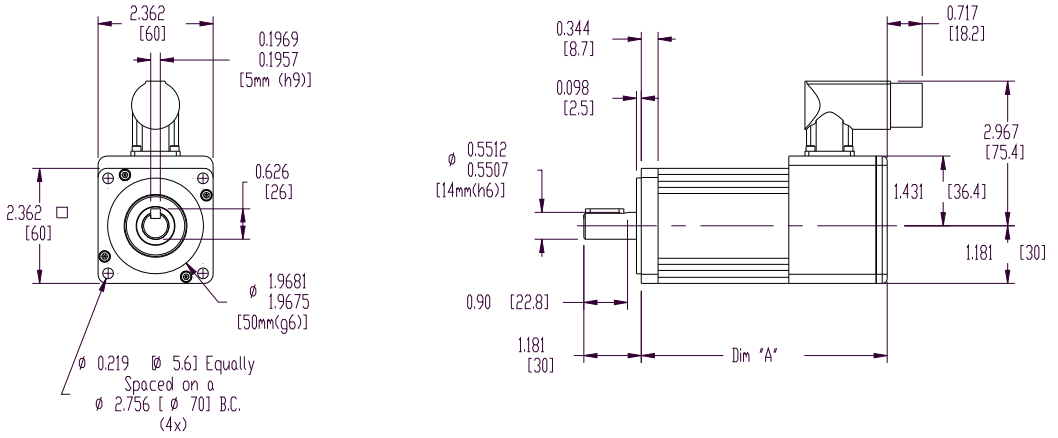
RTG060



Dim	1 Stack Stator 1 Stage Gearhead	2 Stack Stator 1 Stage Gearhead	3 Stack Stator 1 Stage Gearhead
A	8.882 [226]	10.132 [257]	11.382 [289]
Dim	1 Stack Stator 2 Stage Gearhead	2 Stack Stator 2 Stage Gearhead	3 Stack Stator 2 Stage Gearhead
A	9.927 [252]	11.177 [284]	12.427 [316]

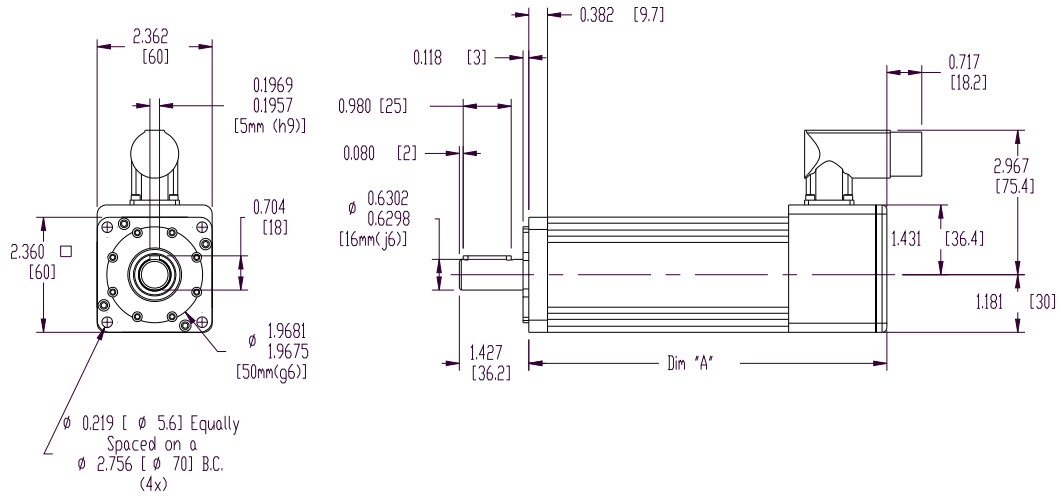
RSM060 and RSG060 Dimensions

RSM060



Dim "A"	
1 Stack, no brake	5.048 [128]
2 Stack, no brake	6.298 [160]
3 Stack, no brake	7.548 [192]

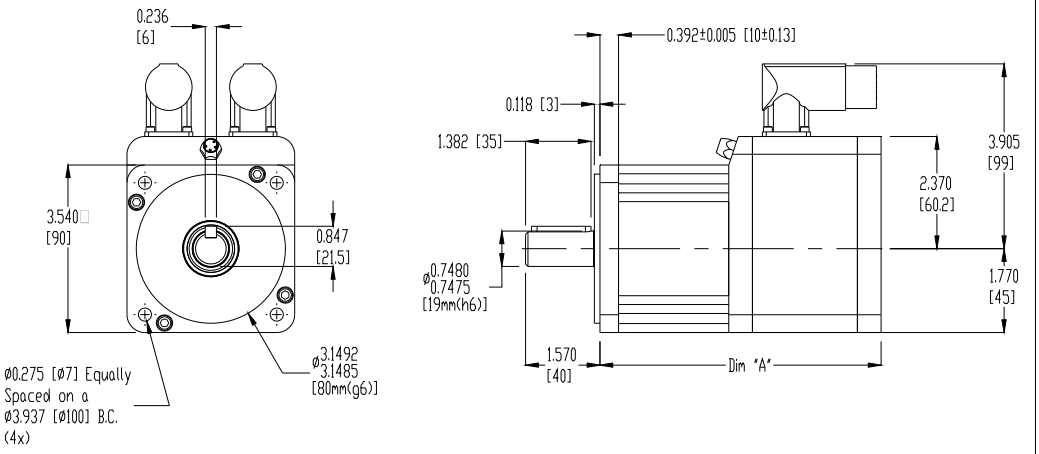
RSG060



Dim	1 Stack Stator 1 Stage Gearhead	2 Stack Stator 1 Stage Gearhead	3 Stack Stator 1 Stage Gearhead
A	7.351 [187]	8.601 [218]	9.851 [250]
Dim	**1 Stack Stator 2 Stage Gearhead**	**2 Stack Stator 2 Stage Gearhead**	**3 Stack Stator 2 Stage Gearhead**
A	8.396 [213]	9.646 [245]	10.896 [277]

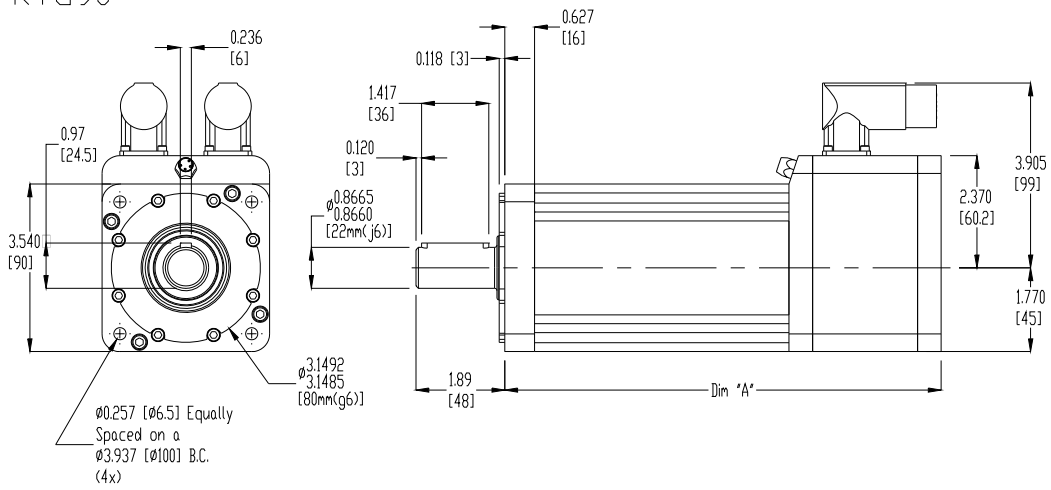
RTM090 & RTG090 Dimensions

RTM90



Dim"A"	
1 Stack, no brake	5.937 [151]
2 Stack, no brake	6.937 [176]
3 Stack, no brake	7.937 [202]

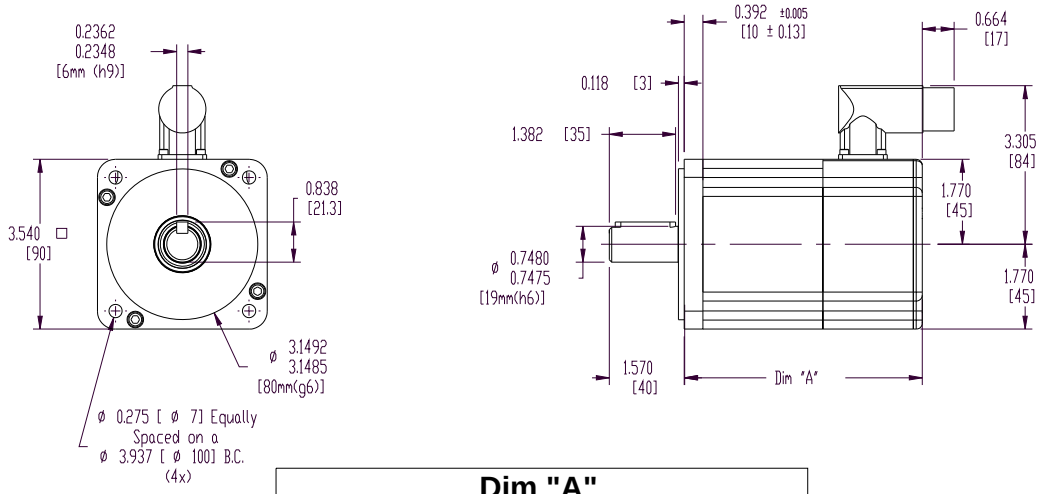
RTG90



Dim	1 Stack Stator 1 Stage Gearhead	2 Stack Stator 1 Stage Gearhead	3 Stack Stator 1 Stage Gearhead
A	9.217 [234]	10.217 [260]	11.217 [285]
Dim	1 Stack Stator 2 Stage Gearhead	2 Stack Stator 2 Stage Gearhead	3 Stack Stator 2 Stage Gearhead
A	10.482 [266]	11.482 [292]	12.482 [317]

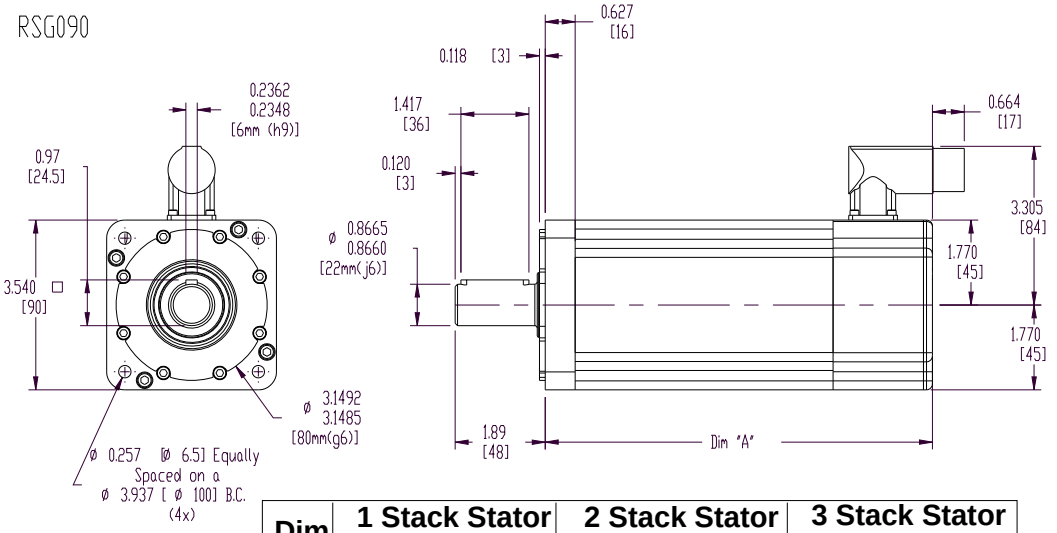
RSM090 & RSG090 Dimensions

RSM090



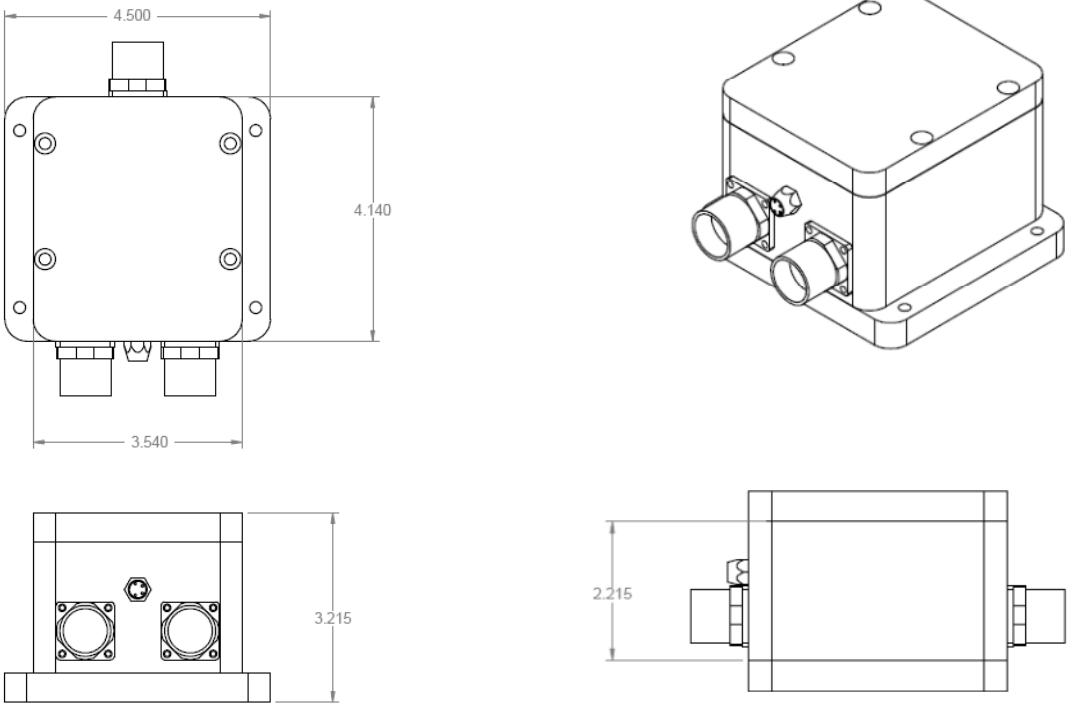
Dim "A"	
1 Stack, no brake	4.964 [126]
2 Stack, no brake	5.964 [152]
3 Stack, no brake	6.964 [177]

RSG090

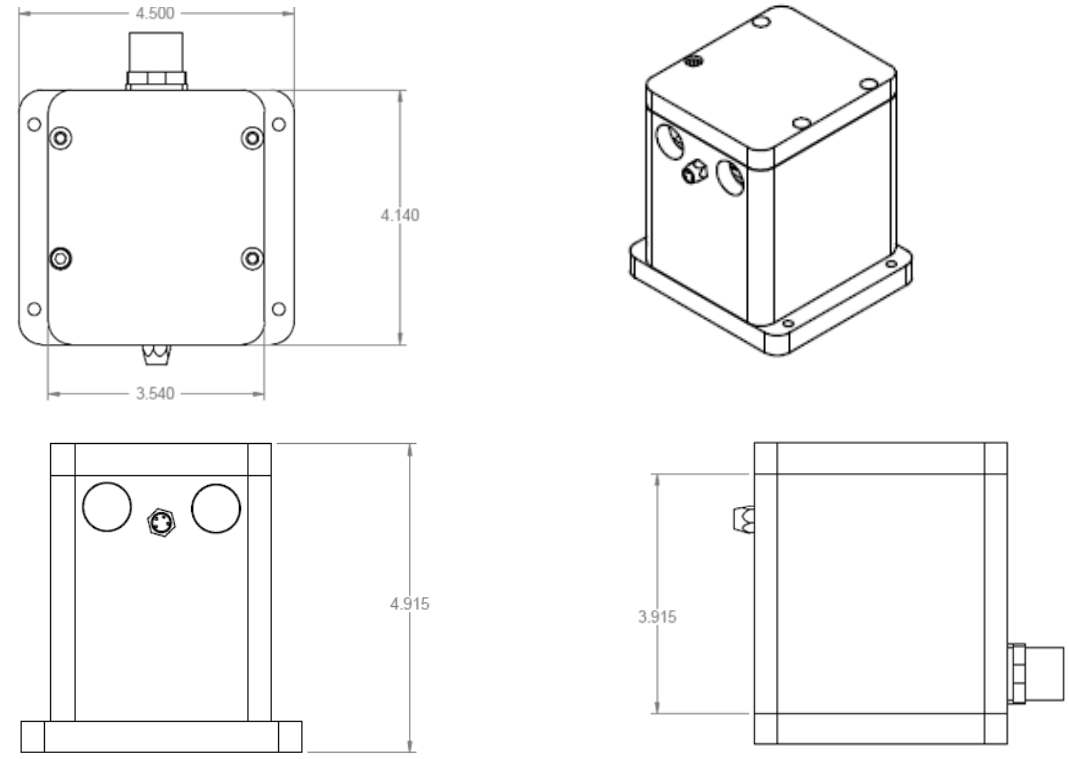


Dim	1 Stack Stator 1 Stage Gearhead	2 Stack Stator 1 Stage Gearhead	3 Stack Stator 1 Stage Gearhead
A	8.074 [205]	9.074 [230]	10.074 [256]
Dim	**1 Stack Stator 2 Stage Gearhead**	**2 Stack Stator 2 Stage Gearhead**	**3 Stack Stator 2 Stage Gearhead**
A	9.339 [237]	10.339 [263]	11.339 [288]

TRA500 Dimensions



TRA500 - I

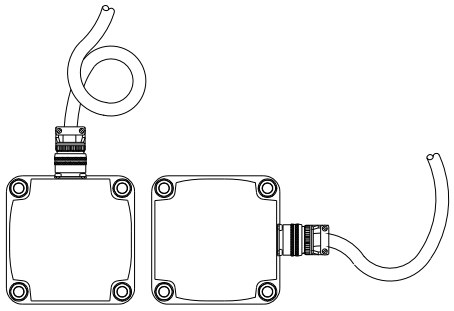


TRA500 –N-G-E,-P

Cable Routing

Over time, liquid contaminants such as oil and cleaning solutions will run down the cables and into any exposed connectors. To minimize the introduction of contaminants to the connector, route the cables so that there is a loop in the cable just prior to its attachment to the connector.

Two examples are shown below, depending on the orientation of the connectors. Units mounted in such a way that the connectors are on the bottom surface of the actuator require no looping.

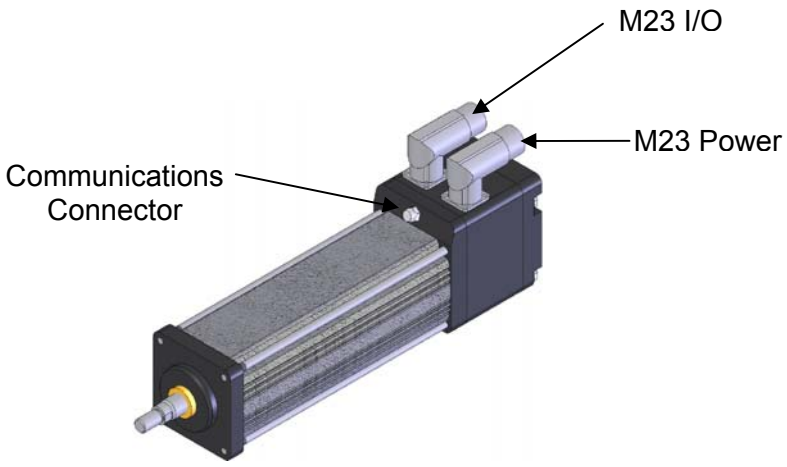


Top Mount Loop Side Mount Loop

In order to avoid the risk of crosstalk between power and signal cables it is recommended that the power cable be segregated from the I/O and communications cables as much as possible. Where power and signal cable proximity is required keep their parallel run distance to a minimum and cross cables at right angles.

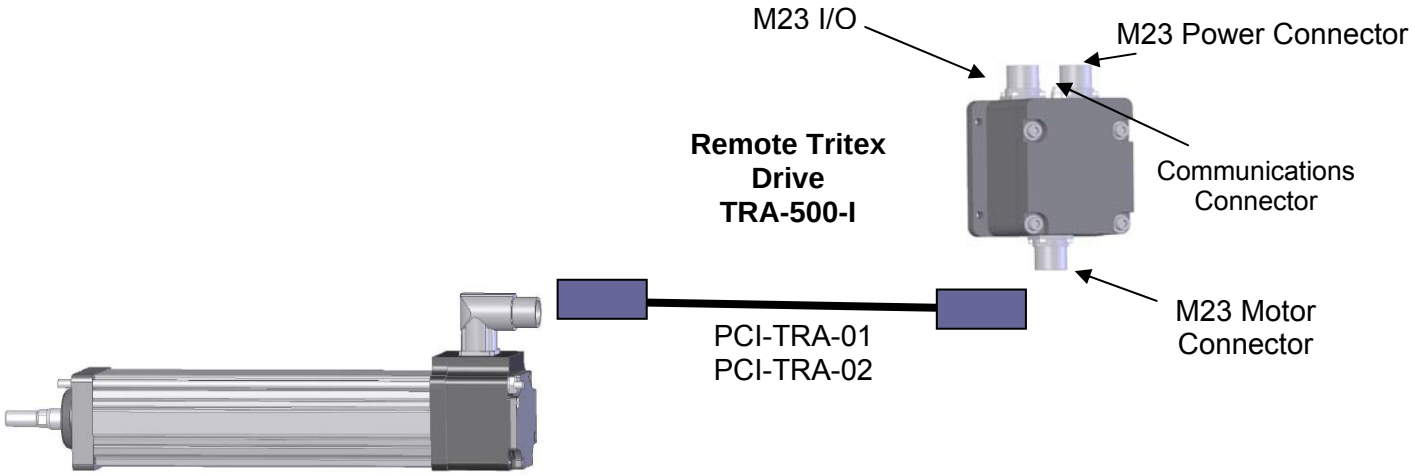
Tritex Configurations

The models TLM, RTM & RTG include the drive and motion controller integrated into the rear of actuator. Various power and I/O connections are available. With M23 connectors (shown below), embedded flying leads, embedded leads with M23 connectors on the end. See ordering section for model mask information.



TLM 30 with M23 connectors, Connector Option I

The Models TSM, RSM & RSG are designed to be used with the remote Tritex drive and motion controller, model TRA500, the two are connected via a 1 or 2 meter cable. The TRA500 always comes with an M23 connection to the actuator. The actuators are available with the motor power and feedback cable embedded into the actuator with an M23 connector on the drive end of 1 or 2 meter cable or with the M23 connector mounted directly on the actuator (as shown below). In the later case, a PCI-TRA-01 or PCI-TRA-02 cable is used to connect the actuator to the TRA500.



TSM 20 with M23 connector and TRA500 with M23 connectors

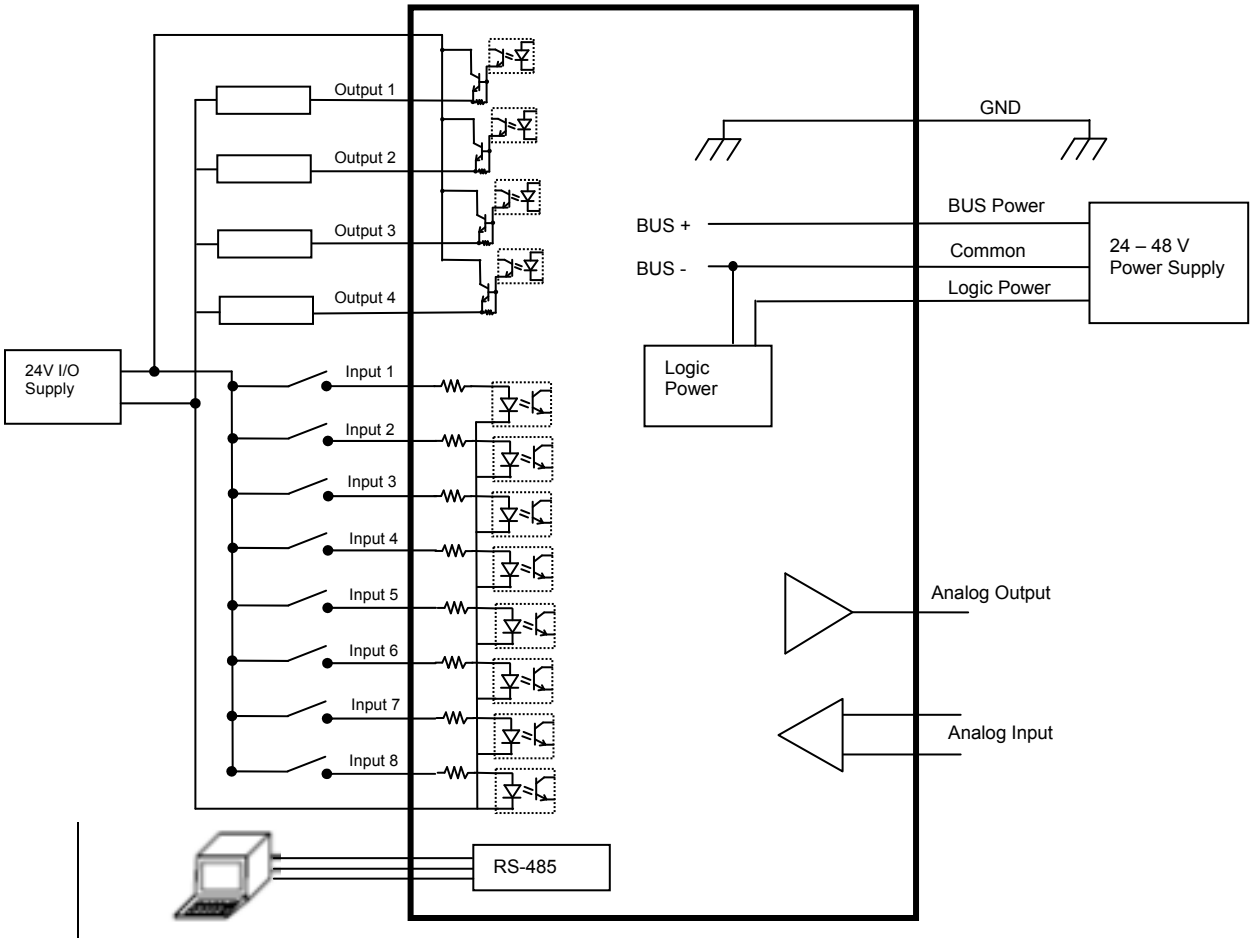
The TRA 500 is available with several connector options for power and I/O.

- N and G option code: No external connector is provided, two NPT (N) or PG (G) holes are provided, the back cover plate is removed to access power and I/O terminals for customer connection.
- I option provides one M23 connector for and one M23 connector for I/O, these connectors are intended for use with TTIPC power cable and TTIOC I/O cable.
- B option (Embedded leads) provides a cable with factory connections inside the drive with an IP 65 cable gland and flying leads
- P option is an provides extension cables with M23 connectors

Electrical Installation

Introduction

All of the required power components and motion processor are contained in the actuator or drive housing.



Power Supply Selection

The Tritex actuator requires DC power. The actuator Bus and Logic supplies will operate on voltages of 24 or 48 V DC nominal. The continuous operating range is 20-60 VDC. The drive has internal Bus over-voltage fault that will occur at 85VDC. The input current requirements are dependent on the actuator power required for the installation. The I/O supply is nominally 24V with a maximum of 30V. The actuator can be powered from a single 24 volt regulated supply (see single power supply configuration).

The power supply required is dependent on the speed and power required by the application. A 48 volt supply will allow the motor to deliver maximum rated speed, (specifications in Overview section) a 24 volt supply will allow the motor to deliver ½ the maximum rated speed. The amount of current need from the supply is proportional to the power needed by the application.

Exlar offers a 48 volt unregulated supply rated at 10 amps continuous output, TTPS1048 (see Accessories section).

Regulated vs Unregulated Power Supplies

Either regulated or unregulated power supplies can be used for the bus and logic power, however, in many cases the unregulated supplies are better suited for drive applications. The over current and over voltage protection usually provided with a regulated supply can cause the power supply to momentarily shut off and then recover during normal acceleration and deceleration of the load. Declaration or lowering of a load can easily cause a regulated supply to go into over voltage protection mode and shut down or be permanently damaged. If a regulated supply is used a diode must be added to prevent motor and load energy from being generated onto the power supply during deceleration, see diagrams next page.

Unregulated supplies have the advantage of being able to supply peak currents without overloading and will not trip on high voltage. Unregulated supplies have a larger capacitance at the output, especially when compared to switching regulated supplies, providing greater energy absorption during deceleration of the load. For installations that require even more energy to be absorbed such as lowering of a load or applications that back drive the actuator, a shunt regulator must be used.

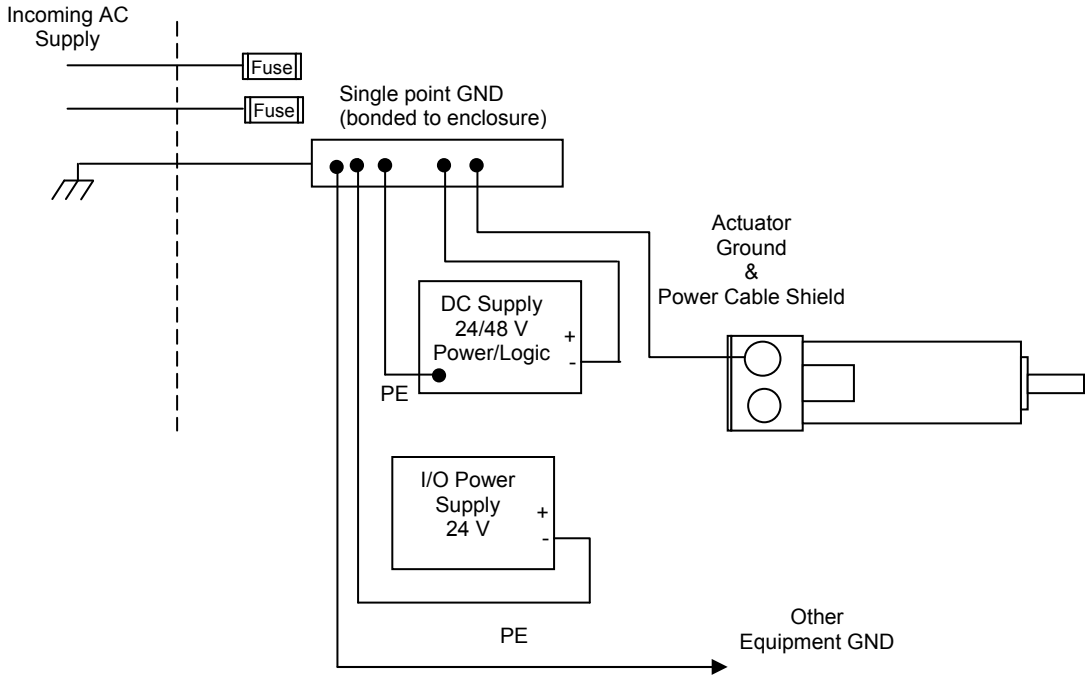
CAUTION

During deceleration of the load the energy generated from the motor and the load will increase the bus voltage and could possibly damage the output of a regulated power supply. If a regulated power supply is used for bus power, a blocking diode should be installed to protect the power supply. See Power Supply Wiring Diagrams section below

Grounding

WARNING

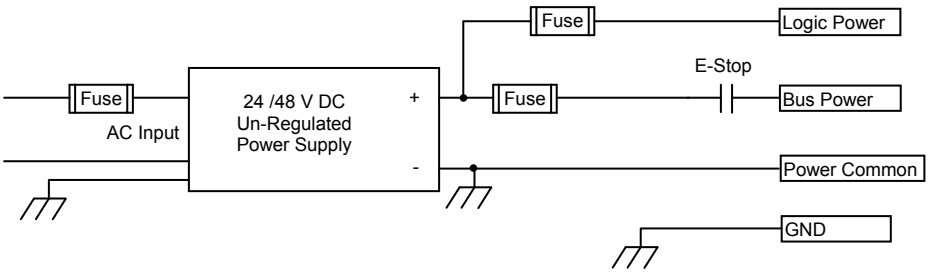
The actuator and all power supply PE and negative connections must be properly grounded using a single point grounding method.



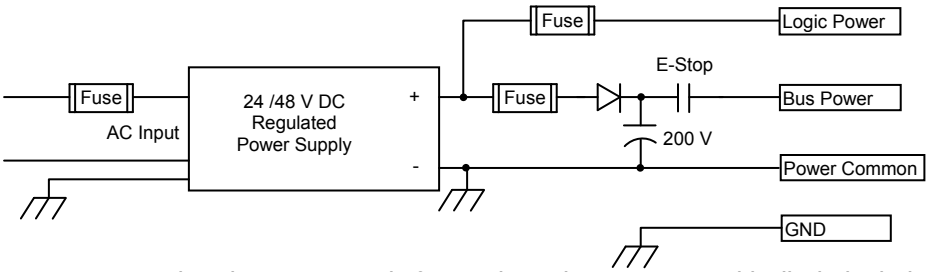
Grounding Diagram

Power Supply Wiring Diagrams

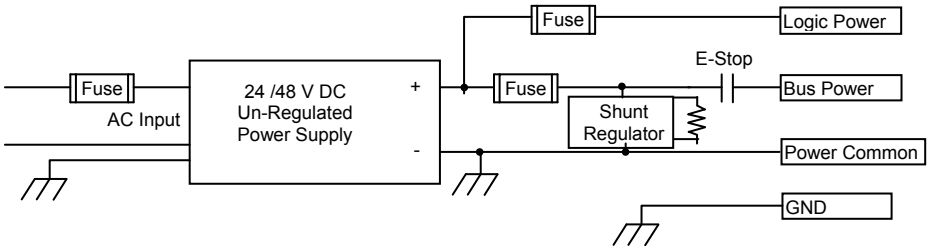
WARNING **All installations should provide a method of removing bus power during an emergency stop condition. The actuator enable function should not be relied on for this function when equipment or personnel safety is required. Disconnect only the + bus power, do not disconnect the – bus power.**



Un-Regulated Power Supply for Logic and Bus power



Regulated Power Supply for Logic and Bus power, with diode isolation and optional extra capacitance



Un-Regulated Power Supply for Logic and Bus power, with a shunt regulator

CAUTION **Reversing polarity of the Bus Power (+) and Power Common (-) will cause a short circuit, which must be protected by the input fuse. See fusing below**

Power Supply Wiring and Fusing

	Fuse	Wire
Bus Power	15 Amp 125V DC. Buss type ABC or similar.	12 gauge
Logic Power	2 Amp 125V DC. Buss type ABC or similar.	18 gauge

12 gauge wire is recommended for bus power to reduce voltage drop across the wire during peak force/torque demands. If the application does not require high peak or continuous power, the wire gauge can be reduced.

WARNING

If the wire gauge for bus power is reduced the fuse Amp rating must also be reduced in accordance with wire size, type and local regulations.

Power Supply Connections

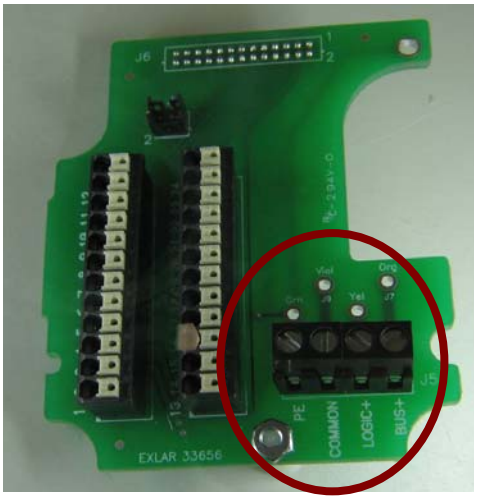
Power Connector pin-out, M23 Connectors, I or P Connector option

Signal	Pin for "I" or "P" connector option	Wire Color for "B" Connection option and TTICP cable	
		Black Outer Jacket	Yellow Outer Jacket
Bus Power (+) 24-48 VDC	1	Brown	Blue
Logic Power (+) 24 -48VDC	3	Blue	White
Power Common (-)	4	Black	Black
PE (GND)	2	Green	Green
N/C	A		Orange
N/C	B		Red
N/C	C		White/black
N/C	D		Red/Black

Front view I or B connector option

Power Connections on Terminal board, N or G Connector option

Signal	Terminal Label for Nor G	Minimum Wire Ga.
Bus Power (+) 24-48 VDC	Bus +	14
Logic Power (+) 24 -48VDC	LOGIC +	18
Power Common (-)	COMMON	14
PE (GND)	PE	14



Tritex Input and Output Wiring

Input/Output Connections

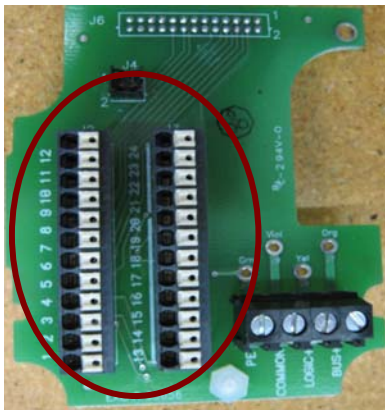
19 pin I/O connector for I or P connector options.

FUNCTION	Pin for "I" or "P" connector option	Wire Color code TTICP cable and "B" connector option
INPUT1	1	White/Yellow
INPUT2	2	White/Red
INPUT3	3	White/Green
INPUT4	4	White/Black
INPUT5	5	Red/Black
INPUT6	7	Red/Green
INPUT7	8	Red/Yellow
INPUT8	9	Beige
Field I/O Power (+24 V)	6	Red
Field I/O Common	19	Black
ANALOG IN+	10	Green
ANALOG IN-	11	White
ANALOG OUT +	13	Blue
ANALOG OUT reference	14	Orange
OUTPUT4	15	White/Brown
OUTPUT3	16	White/Orange
OUTPUT2	17	White/Blue
OUTPUT1	18	Light Red
Shields	12	Drains

Front view "I" or "B" connector option

Terminal board connections for “N” and “G” connector option

Terminal #	Function	Terminal #	Function
12	Field I/O Power (+24 V)	24	Output 1
11	Field I/O Common	23	Output 2
10	INPUT 1	22	Output 3
9	INPUT 2	21	Output 4
8	INPUT 3	20	485 -
7	INPUT 4	19	485 +
6	INPUT 5	18	485 Common
5	INPUT 6	17	Shield
4	INPUT 7	16	ANALOG OUT +
3	INPUT 8	15	ANALOG OUT -
2	ANALOG IN+	14	Shield
1	ANALOG IN-	13	Shield



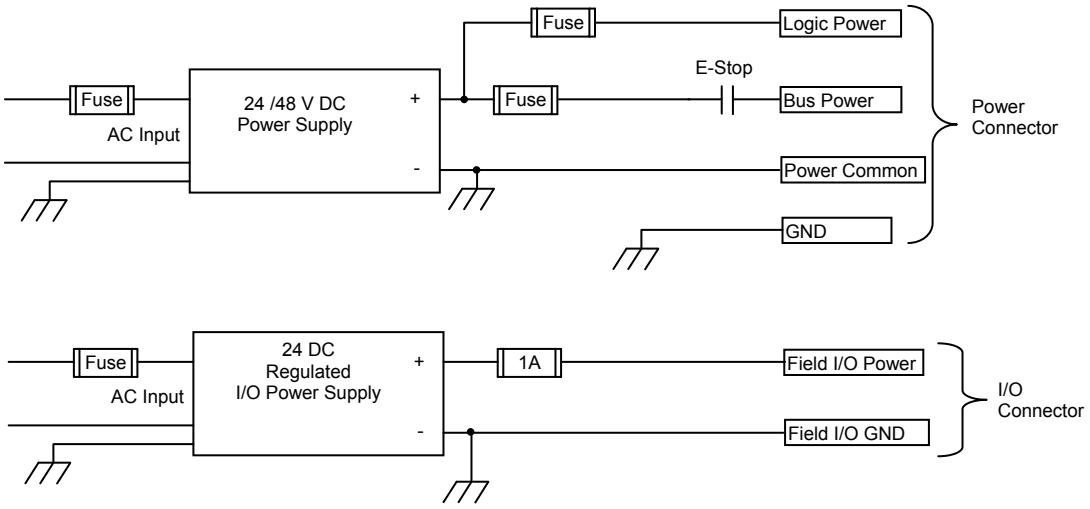
TRA500 I/O Cable color code with B Connection Option

Terminal #	Function	Color	Terminal #	Function	Color
12	Field I/O Power (+24 V)	red	24	Output 1	light red
11	Field I/O Common	black	23	Output 2	white/blue
10	INPUT 1	white/yellow	22	Output 3	white/orange
9	INPUT 2	white/red	21	Output 4	white/brown
8	INPUT 3	white/green	20	485 +	n/c
7	INPUT 4	white/black	19	485 -	n/c
6	INPUT 5	red/black	18	485 Common	n/c
5	INPUT 6	red/green	17	Shield	n/c
4	INPUT 7	red/yellow	16	ANALOG OUT +	blue (pair w/orange)
3	INPUT 8	beige	15	ANALOG OUT -	orange (pair w/blue)
2	ANALOG IN+	green (pair w/white)	14	Shield	drain
1	ANALOG IN-	white (pair w/green)	13	Shield	drain

I/O Power Supply

The digital inputs and outputs are optically isolated from the other power supplies. To maintain this isolation a separate power supply must be used with an output within the range of 10 to 30 VDC. A one amp supply is sufficient for all applications.

Two Power Supply Configuration

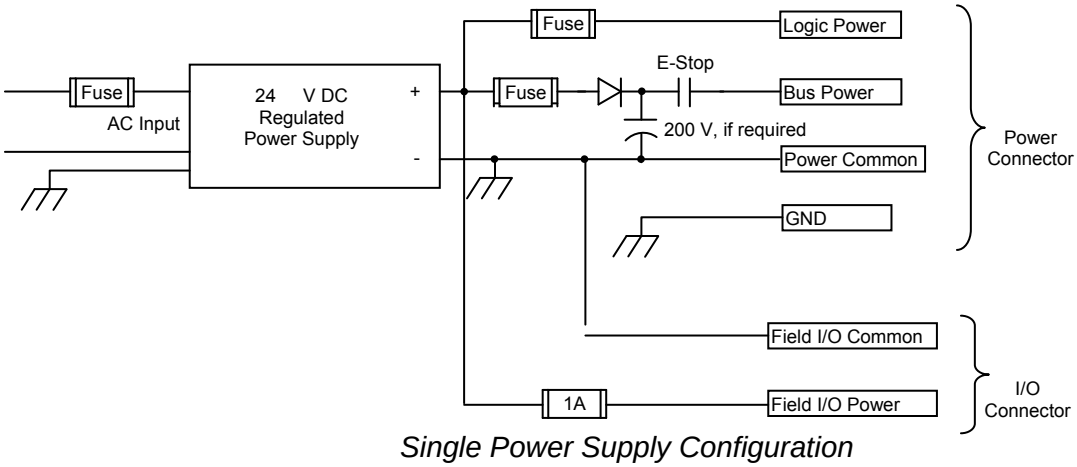


2 power supply configuration, maintaining I/O Isolation

Single Power Supply Configuration

For applications not requiring I/O isolation a single power supply can be used; however, the supply must be a regulated type and less than 30 Volts.

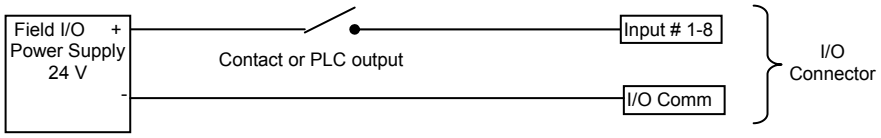
CAUTION **The single power supply configuration cannot be used when bus power supply is greater than 30 Volts. When a single power supply configuration is used for bus power and I/O power a blocking diode must be added to prevent the I/O voltage from rising above 30 volts when the actuator is generating voltage onto the bus.**



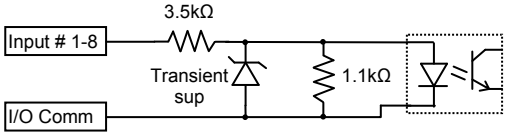
Single Power Supply Configuration

Digital Inputs

The Tritex series product has 8 optically isolated digital inputs. These inputs are sourcing only, they require a positive voltage to turn on. Each input can be assigned to any of the internal input functions (see software section).



Input wiring (external)



Input Circuit (internal)

Digital Input Specifications

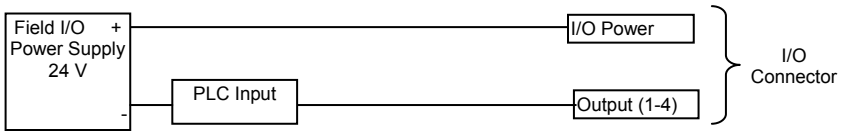
Description	Specification
Input Voltage Range	0 to 30 VDC
On state voltage range	10-30 VDC
Off state voltage range	0-5 VDC
On state current 10 V (min) 24 v (nominal) 30 V (maximum)	 2.6 ma 6.6 mA 8.3 mA
Nominal Impedance (24V)	3.6kΩ
Off state current (max)	1.0 mA
Update rate	2 msec (typical)

Digital Outputs

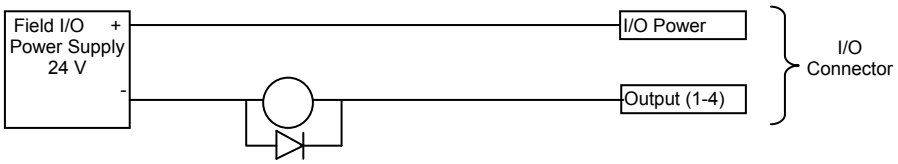
The Tritex series product has 4 optically isolated digital outputs. These outputs are sourcing only, they provide a positive voltage when on. Each output can be assigned to any of the internal output functions (see software section).

CAUTION

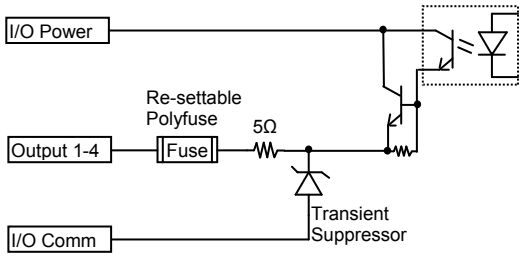
Each output is rated to continuously drive a 50 mA load and is short protected at 250 mA with re-settable fuse.



External wiring of outputs for connection to PLC



External wiring of outputs for connection to inductive load



Output Circuit (internal)

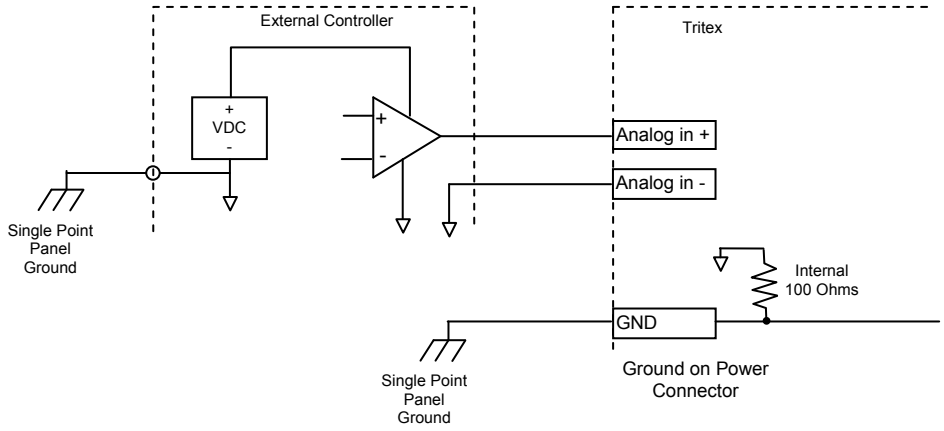
Digital Output Specifications

Description	Specification
Operating voltage range	0 to 30 VDC
On state maximum continuous current	50 mA (0.050 Amps)
On state voltage drop (@ 50 mA)	1.5 V typical
Fold back short circuit protection	0.250 Amps
Update rate	2 msec

Analog Input

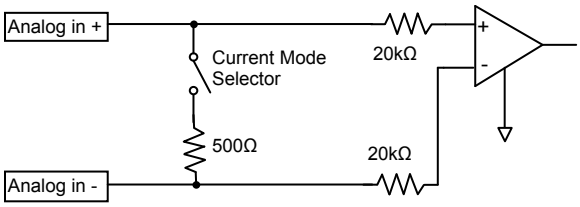
An analog input is provided for use as a position, velocity or current command. The input can be configured to operate using a 0-10 VDC signal, or using a 0-20ma current signal.

(See software section for configuration of the analog input and analog positioning parameters.)



Analog input wiring from voltage or current control external controller

Note: Analog input reference from an external controller must be referenced to single point ground to prevent damage to the analog input circuit.



Internal Analog Input Circuit

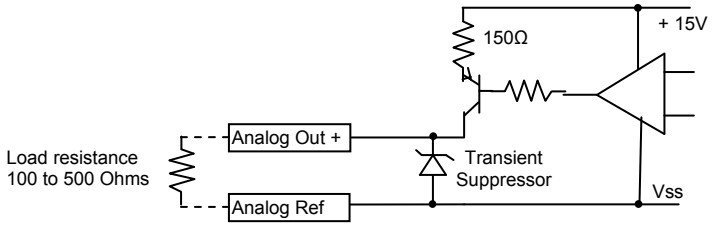
Analog Input Specifications

Description	Specification
Voltage Input Range	0V to + 10.0V
Current input range	0 to + 20 mA
Input resolution	12 bit over total range
Update rate	2 msec

Analog Output

A 0-20 mA analog output is provided. The function of this output is programmable. It can be used for position, velocity or current monitoring. For installations requiring a voltage signal a resistor between 100Ω and 500 Ω can be connected across Analog Out + and Analog Out – to generate 0-10 Volts to be measured by a high impedance voltage input.

The intent of this output is to provide a “monitor” type value not a “control” value, meaning the performance is not intended for the user to close a high speed position loop around this signal.



Analog output

Analog Current Output Specifications

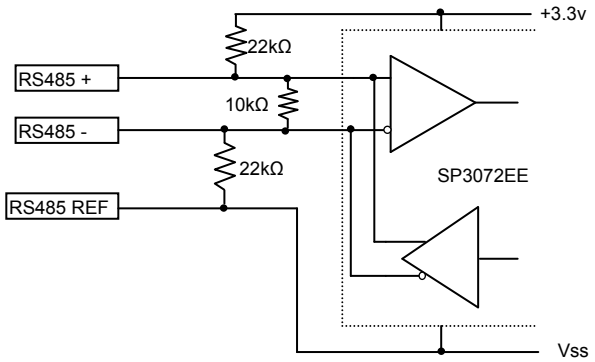
Description	Specification
Current Output Range	0 - 22 mA
Load Range	100 to 500 Ω
Output resolution	11 bits

Communications

Serial communications to the actuator is provided through the Communication connector. The serial interface is two wire non-isolated RS-485 network. The actuator supports the Modbus RTU protocol for access to all drive parameters (see Modbus Parameter Reference). The Default baud rate is 19.2k. The default Modbus address is 1.

8 mm connector:

Function	Pin number	Wire color for TTCOM
485+	1	Brown
485-	3	Blue
485 COM	4	Black
Shield	2	Drain

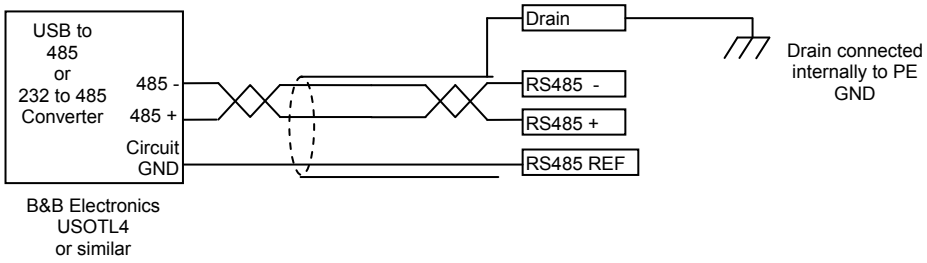


Internal RS 485 Circuit

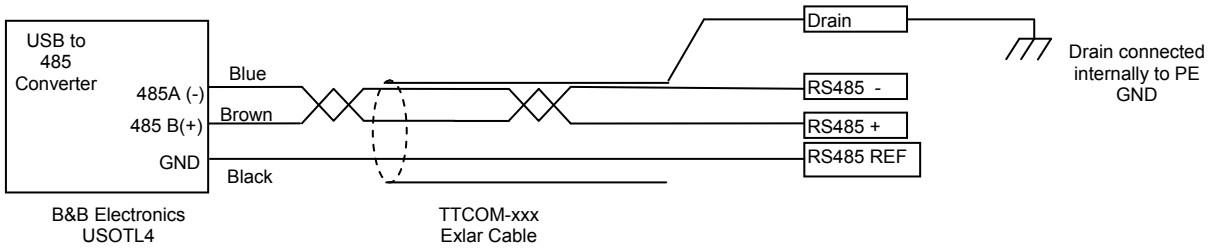
PC Communications

When using the Expert software for set-up and diagnostics an RS485 converter will be required to interface between one of the PC communication ports and the RS-485. This can be either a USB to 485 converter, such as the B&B Electronics® USOTL4 or an RS 232 to RS485 converter, such as the 485OT9L. See Accessories section.

CAUTION **It is important that the RS485 REF is connected to the circuit common of the converters 485 output. Failure to connect could cause damage to the drive, the converter or the PC port.**



Typical RS 485 connection to external converter



Connection to B&B USOTL4 using TTCOM cable

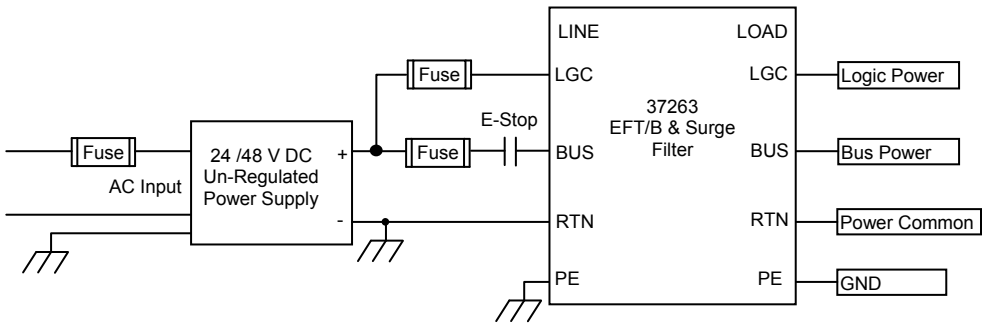
EMC Considerations

Tritex actuators are designed not to create or be affected by electromagnetic interference in most applications. Under extreme conditions there may be unwanted electromagnetic interaction between the Tritex actuator and other equipment. It is the responsibility of the installer to ensure that the complete system meets all relevant EMC (electromagnetic compatibility) emission and immunity requirements.

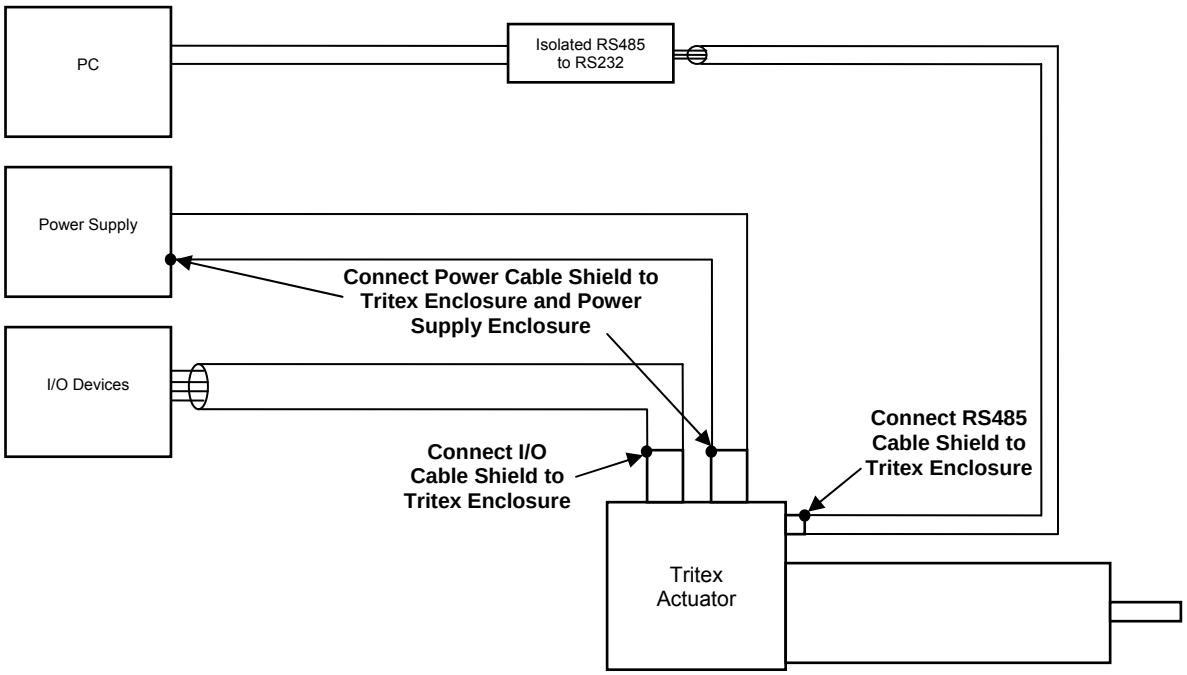
Tritex Embedded drives are designed to be IEC/EN 61800-3:2004-08 compliant when using shielded cables and the 37263 EFT/B and Surge Filter (see Accessories section). The external filter may not be necessary if the power supply already contains EFT/B and Surge suppression. The figure below shows how to connect the external filter if it is required.

General EMC guidelines that should be followed when installing and designing a system include:

- House all components in conductive enclosures
- Connect components using shielded cables grounded to the component enclosures (see figure on next page)
- Ground components using the single point grounding scheme described in the *Grounding* section of this manual
- When necessary, remove paint from mating surfaces that may prevent a good ground connection from being made
- Make ground connections as short as possible and use flat braided cable when available to create low impedance ground connections
- Keep cable runs as short as possible and power and signal cables as far apart as possible, only crossing them at right angles, as described in the *Cable Routing* section of this manual



Power Connection using External EFT/B & Surge Filter

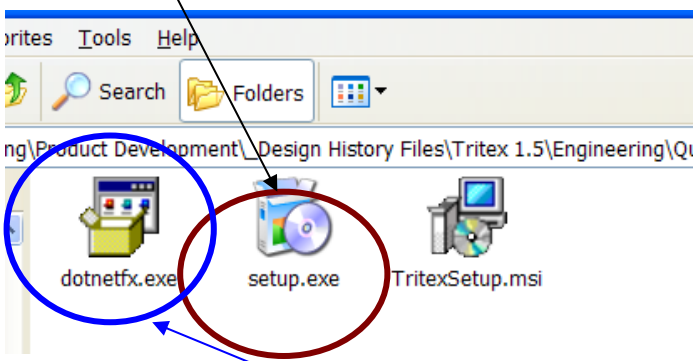


Cable Shield Grounding Example

Expert Software

Installation

A CD is provided with each Actuator and contains the Installation Operation and Maintenance manual as well as the Expert software. The software is also available for download from www.Exlar.com.
Using Windows Explorer, open the Software Directory from the CD and double Click on the Setup Icon.

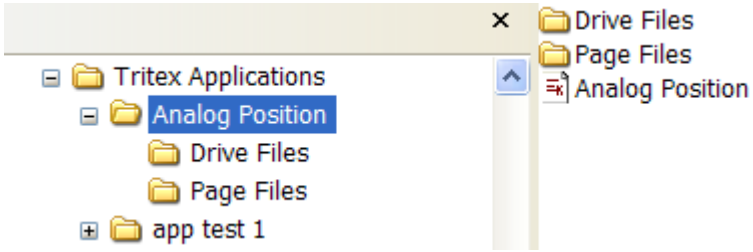


Expert software version 1.4.2.0 and later require Microsoft .NET Framework version 2.0 to be installed on the PC. If this version of .NET Framework is not on the PC a Microsoft message will be displayed suggesting you go to Microsoft.com to download it. This is not necessary as a distributable version of .NET Framework 2.0 has been included on the CD, it can be installed by clicking on the donetfx.exe file.

Overview

The Expert software is designed to allow customized views of the Tritex drive features for various industries and applications. For example a valve application may use different motion features than a clamping application. The concept of different views is intended to simplify and customize the operation by only showing the parameters needed for the specific application and also allow industry specific names for the drive parameters.

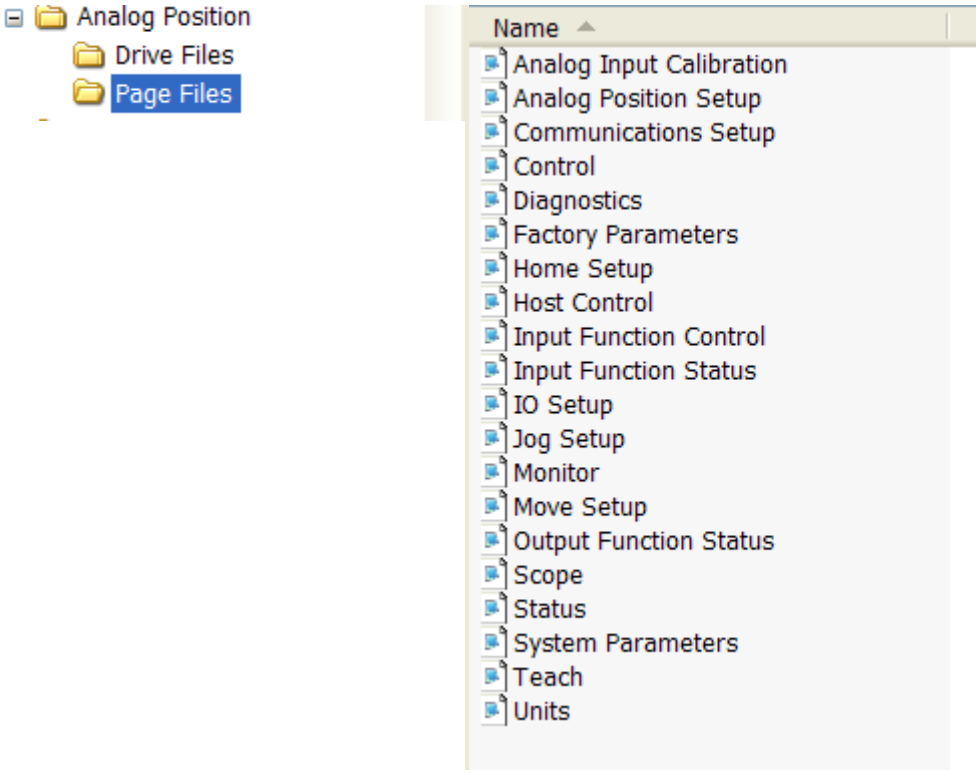
The Expert Software uses a hierarchical arrangement of Application Files, Drive Files and Page Files.



In the above example Analog Position and app test 1 are Application Files.
Each Application folder contains a Drive File folder, a Page File folder and an Application file. The Application File contains the application title, the file name of the last used drive file and file names of the pages used in the application. In the example below “Generic” is the name of the drive file.

The Drive File directory contains a list of drive files for this application. The Drive file contains the upload and down load parameter values as well as parameter names, Modbus addresses, scaling, default values. The parameter values in the Drive File are the data actually downloaded / uploaded from the drive. Drive file is named Generic in above example.

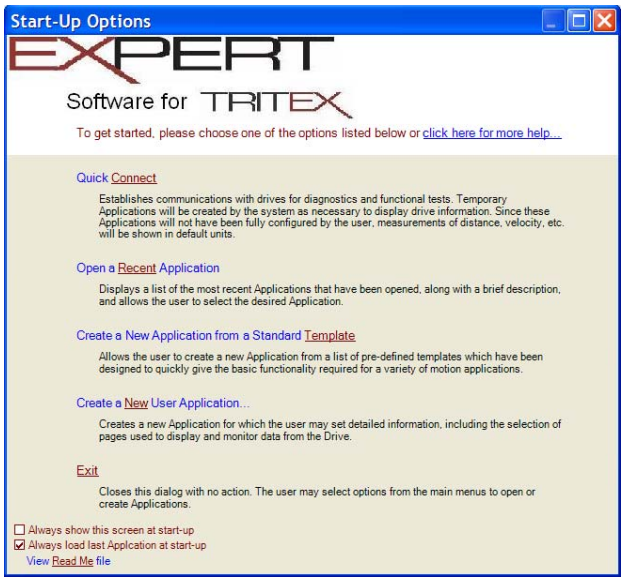
The Page Files directory contains a Page File for each page in the Application. The Page files contain the information for viewing and controlling the windows screen as viewed in the Expert software.



Opening the Expert Software

Welcome Screen

When the Expert software is opened the Welcome Screen will be displayed. This screen helps users who are unfamiliar with software get started quickly.

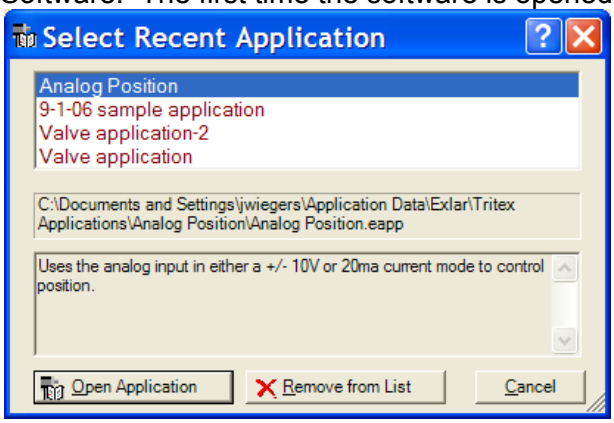

Start-Up Options
EXPERT
Software for TRITEX
To get started, please choose one of the options listed below or click here for more help...
Quick Connect
Establishes communications with drives for diagnostics and functional tests. Temporary Applications will be created by the system as necessary to display drive information. Since these Applications will not have been fully configured by the user, measurements of distance, velocity, etc. will be shown in default units.
Open a Recent Application
Displays a list of the most recent Applications that have been opened, along with a brief description, and allows the user to select the desired Application.
Create a New Application from a Standard Template
Allows the user to create a new Application from a list of pre-defined templates which have been designed to quickly give the basic functionality required for a variety of motion applications.
Create a New User Application...
Creates a new Application for which the user may set detailed information, including the selection of pages used to display and monitor data from the Drive.
Exit
Closes this dialog with no action. The user may select options from the main menus to open or create Applications.
Always show this screen at start-up
Always load last Application at start-up
View Read Me file

Quick Connect

Quick Connect provides a means of connecting and uploading data from a drive, this is intended for use by a service person when the Application File used to create the application is not available. Quick Connect pings the communication port to for drive types and opens a generic application for that drive type which contains all drive parameters. All of the drive parameters will be uploaded for complete diagnostic functions. The parameter names and user units may vary from those originally used.
If the PC communications have not been setup or a drive is not connected, this option cannot be used.

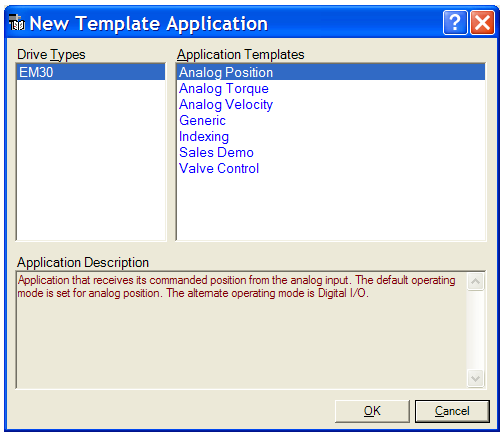
Open a Recent Application

Open a Recent Application will provide a list of the last several applications used by the Expert Software. The first time the software is opened this option will not be available.


Select Recent Application
Analog Position
9-1-06 sample application
Valve application-2
Valve application
C:\Documents and Settings\jwiegers\Application Data\Exlar\Tritex Applications\Analog Position\Analog Position.eapp
Uses the analog input in either a +/- 10V or 20ma current mode to control position.
Open Application
Remove from List
Cancel

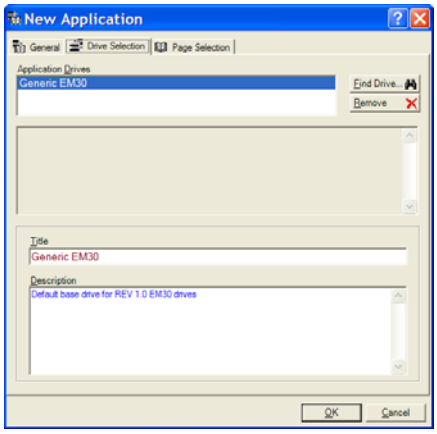
Create an Application from a Standard Template

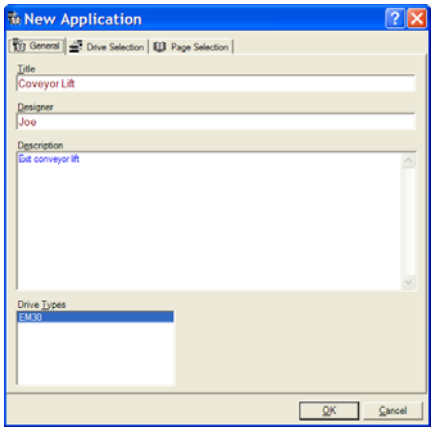
Create an Application from a Standard Template Provides a list of canned applications. The page list has already been created for each these applications for specific drive types with drive existing drive file. Select the ApplicationTemplate then click OK.

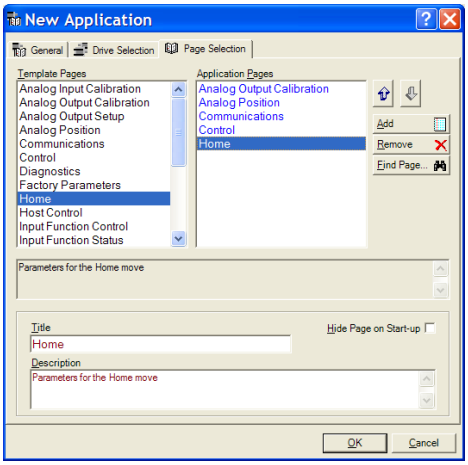


Create a New User Application

Create a New User Application is similar to creating an application from a template except the user is allowed more flexibility. The New Application allows the user to name the application, select drive type, drive file, actuator lead, user units and to select the Pages for the application.







As the pages are added to the Application a title and description is shown. Notice the check box for *Hide Page on Startup*. If this box is not checked the page will be displayed as a tab when the application is opened, if the box is checked the page will be available to the application by selecting View / Pages from the main menu bar. The New Application builder displays pages from a default directory. The find Page button can be add pages from other directories into the application.

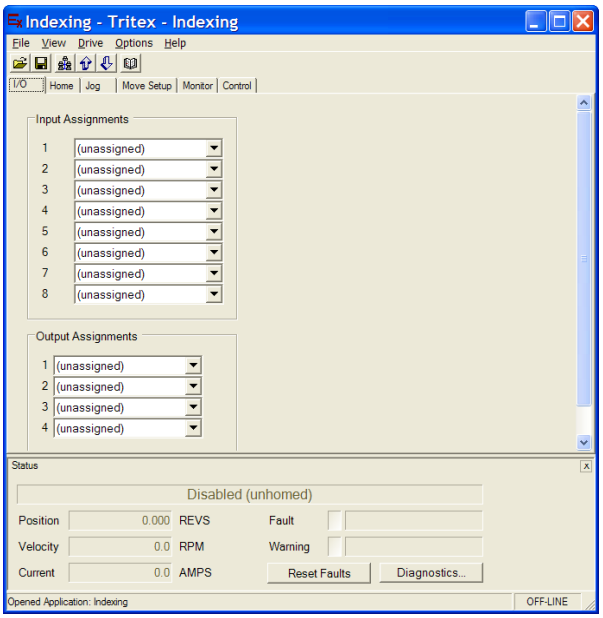
Other Welcome Screen Controls

Exit goes directly into the Expert software without opening an application. The File option on the main menu can be used to open the desired application.

Option check boxes allow the Welcome screen to be bypassed and skip directly to opening the last used application. For experienced users this can save a few clicks.

For more information, click the in the upper right corner of the dialog box for context sensitive help and then click on the desired field.

Operation with an Open Application

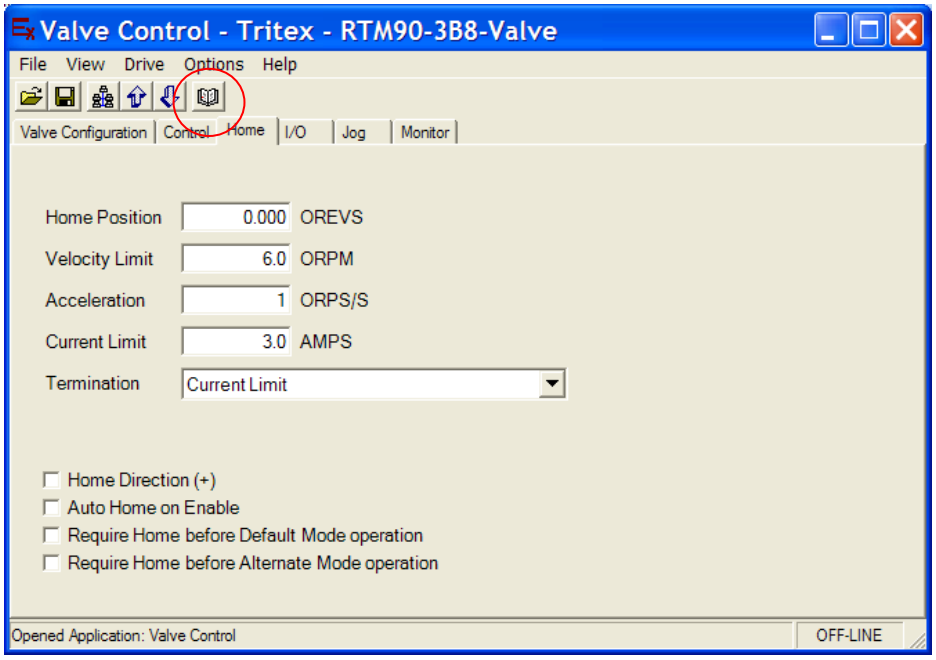


Once an Application is open the pages for the application are shown.

Opening More Pages / Tabs

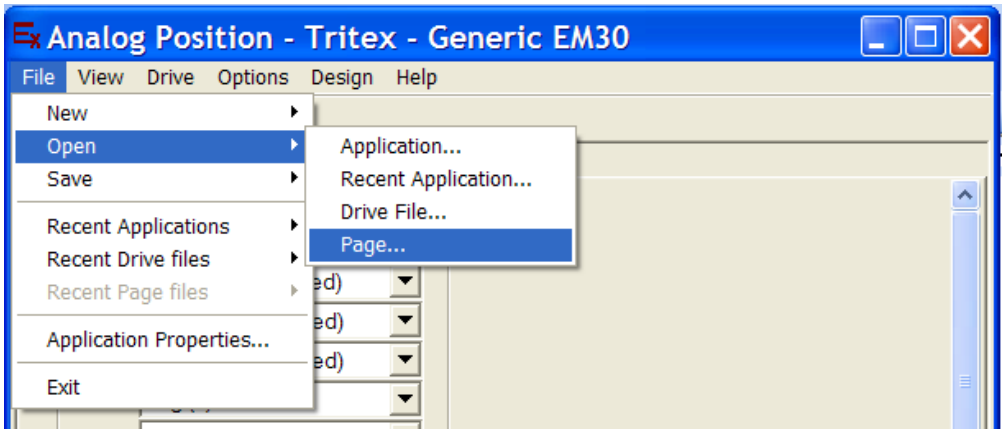
Viewing Pages in the Application

Once an application is open various tabs will be displayed, the tabs displayed are determined either by the Template Application or during the build of a New Application.
The Application will most likely have more pages available than initially appear on the tabs, to view other pages click the Page icon or click View / Pages from the main menu and select the page to be viewed.

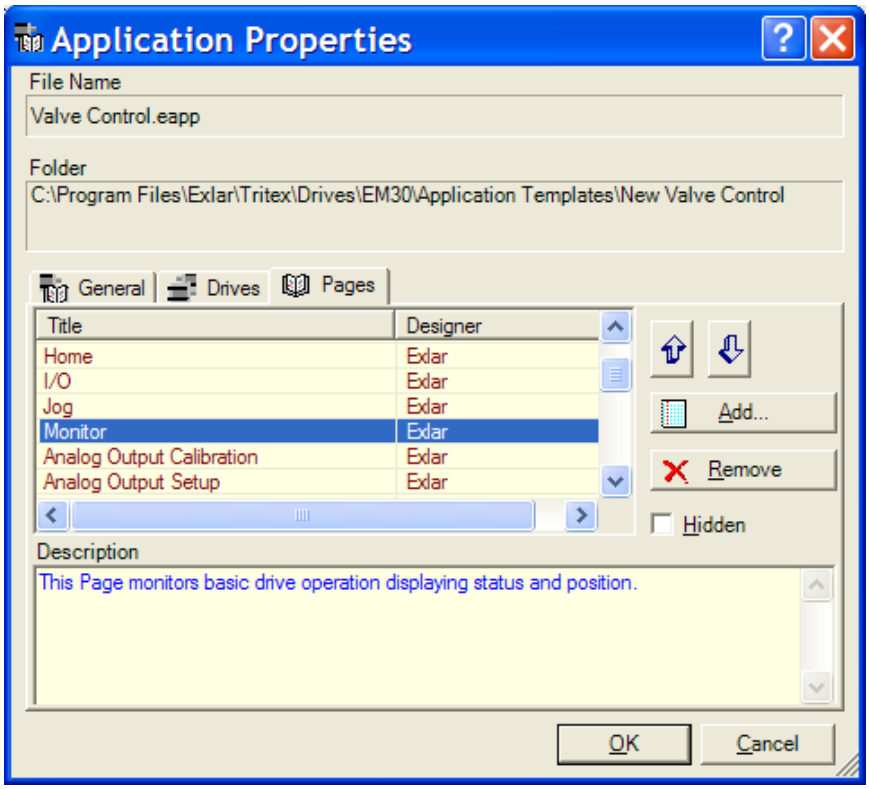

Valve Control - Tritex - RTM90-3B8-Valve
File View Drive Options Help
Valve Configuration Control Home I/O Jog Monitor
Home Position 0.000 OREVS
Velocity Limit 6.0 ORPM
Acceleration 1 ORPS/S
Current Limit 3.0 AMPS
Termination Current Limit
Home Direction (+)
Auto Home on Enable
Require Home before Default Mode operation
Require Home before Alternate Mode operation
Opened Application: Valve Control
OFF-LINE

Viewing Pages not in the Application

If a Page is needed that is not listed in the Application, any page can be opened by selecting File / Open / Page and browsing for pages in other applications. If a page is added, the Application should be saved by selecting File/Save/Application As…



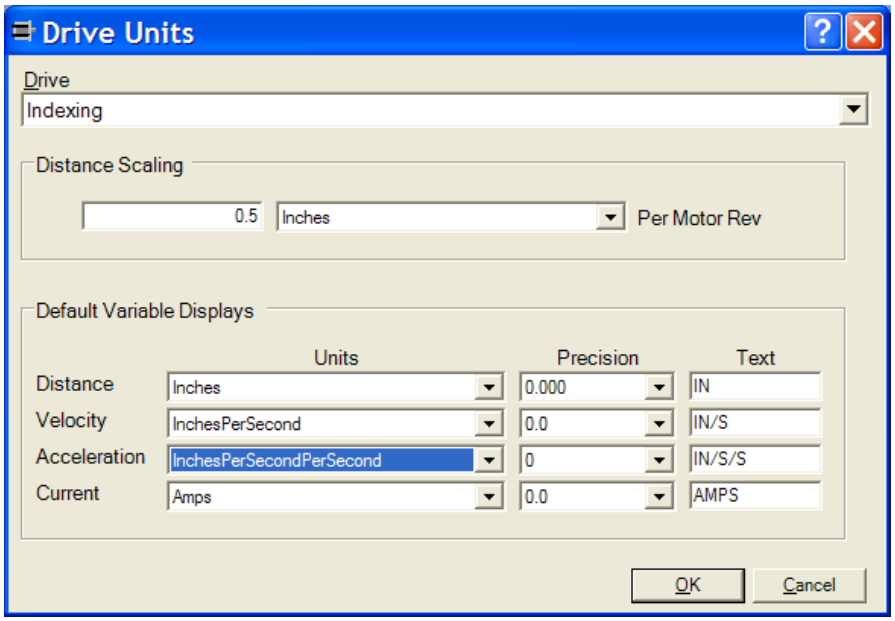
Pages may also be added, deleted or selected as hidden by viewing the Application Properties window, select File/Application Properties and then select the Pages tab.



Basic Steps for Offline Operation

User Units

The first step in setting up a new application is to select the user units. On the main menu bar select Drive/Units and the following page will be displayed.

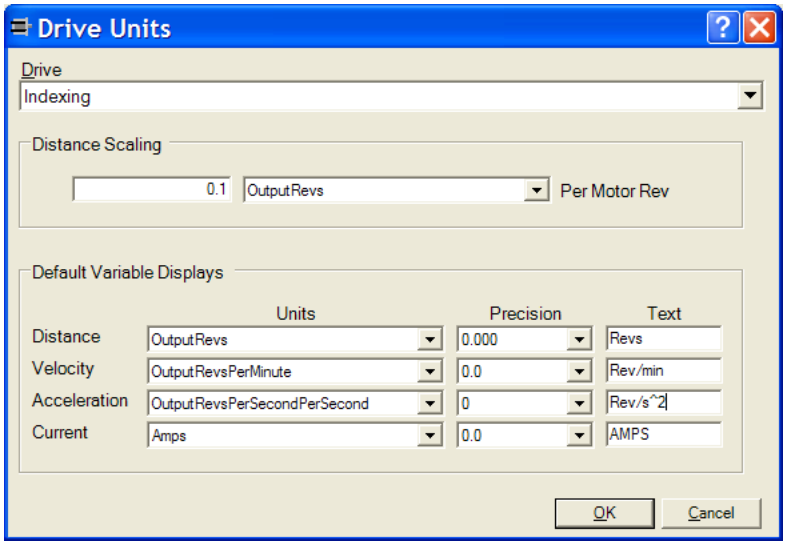


Distance Scaling:
The distance scaling factor can be setup for a linear actuator with an inch per motor rev conversion factor, rotary actuator with an output rev per motor rev conversion factor or for a custom actuator with a user units per motor rev conversion factor.

Select the units for distance, velocity and acceleration units in which the application will work, select the precision to display as, and enter the text that will actually be displayed on the pages. The inch to millimeter and inch meter conversions are done automatically based on the Inches per Motor Rev conversion. Output Revs and Degrees are calculated automatically based on the Output Revs conversion factor. For custom units UserUnits are calculated based on the User Unit per motor rev scale factor.

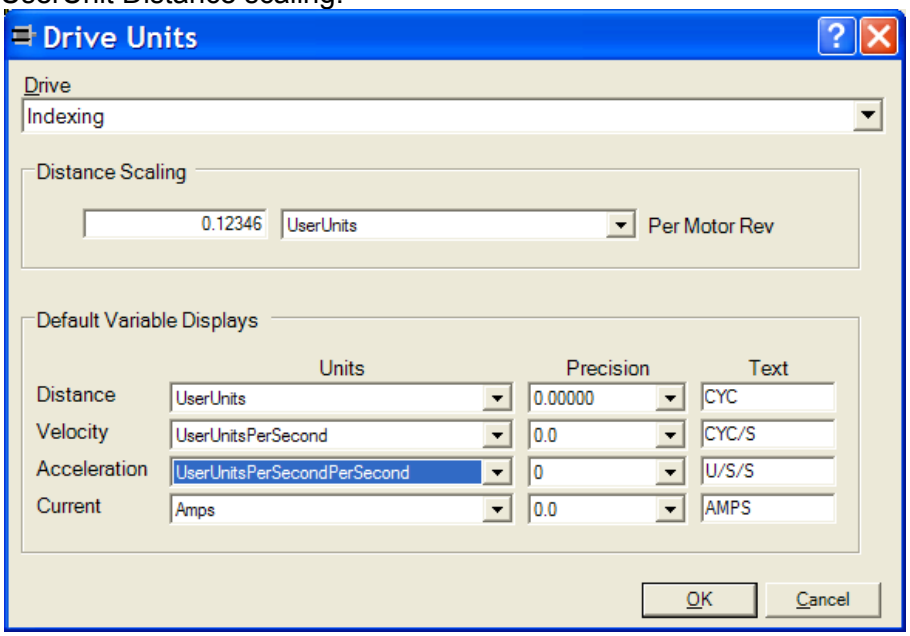
Examples:
For linear actuators select the actuator lead; such as 0.5 inches per motor rev, select Inches, millimeters or meters for the working units and enter the text such as IN, Inches or mm. For velocity select units such as RevsPerMinute, RevsPerSecond, InchesPerSecond or MillimetersPerSecond. Enter the text to displayed such as rpm, ips In/sec etc. For Acceleration select the working units such as InchesPerSecondPerSecond, RevsPerMinutePerSecond, etc. Enter the text to be displayed such as in/sec^2 or rpm/sec.

For Rotary applications with a 10:1 gear reduction select Output Revs.



Distance scaling is 0.1 Output Revs per Motor Rev
For Distance Units select Output Revs, Output Degrees. For Velocity select units such OutputRevsPerMinute, OutputRevsPerSecond, DegreesPerMinute, or DegreesPerSecond. For Acceleration units select OutputRevsPerSecondPerSecond or DegressPerSecondPerSecond. Then type in the text to displayed for each unit.

When the working distance is other than Inches, mm, m, Output Revs or Degrees use the UserUnit Distance scaling.



For other user units such as Cycle and Cycles/ sec, select UserUnits for Distance scaling and enter the conversion for Cycles per Motor Rev, such 0.123346, Select UserUnits as the working unit, select the precision for display and the text to be displayed such CYC. For velocity working units select UserUnitsPerSecond or UserUnitsPerMinute. For Acceleration select UserUnitsPerSecondPerSecond.

The Table below illustrates which Distance Scale Factor is used for each of working units conversion.

Working Unit	Distance Scale factor used for conversion
Distance	
Inches	Inches
UserUnits	UserUnits
Revs	Internal, always available
Meters	Inches
Millimeters	Inches
OutputRevs	OutputRevs
OutputDegrees	OutputRevs
Velocity	
RevsPerMinute	Internal, always available
InchesPerSecond	Inches
UserUnitsPerSecond	UserUnits
UserUnitsPerMinute	UserUnits
MillimetersPerSecond	Inches
OutputRevsPerMinute	OutputRevs
OutputRevsPerSecond	OutputRevs
OutputDegreesPerMinute	OutputRevs
OutputDegreesPerSecond	OutputRevs
Acceleration	
RevsPerMinutePerSecond	Internal, always available
RevsPerSecondPerSecond	Internal, always available
InchesPerSecondPerSecond	Inches
UserUnitsPerSecondPerSecond	UserUnits
MillimetersPerSecondPerSecond	Inches
OutputRevsPerSecondPerSecond	OutputRevs
OutputDegreesPerSecondPerSecond	OutputRevs

Key Application Pages

With an open application the key pages or tabs that should be addressed for a specific application are:

1. System Setup page, for startup options, limits, fault enables, operating modes, dedicated move and In Position Window. See System Setup section for details.
2. I/O page, for setup of digital I/O assignments. See Digital Input and Output section for detail and descriptions of I/O functions.
3. Home page for set of the Home cycle. See Home Description Section for details.
4. Move page for setup of motion controlled by digital I/O see Move Description Section for Details.
5. Jog page for set of Jog mode, even if the Jog function is not used in the final application it can be handy to test initial motion. See Jog section for details.
6. If Analog Position, Velocity or Torque Modes are used open the appropriate page and see Analog Input section for parameter details.

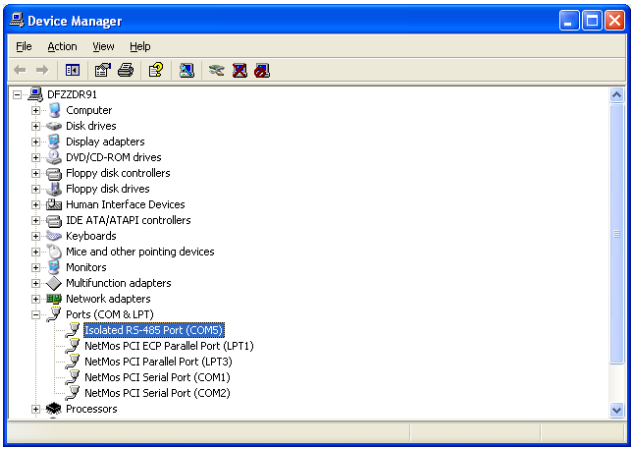
As parameters are changed the text will turn RED, this indicates the parameter has been changed but the drive file with change has not been saved, this indication is also shown when Online operation is active, so if a file is uploaded, any parameters that are different than the open file will show as red.

Communication between PC and Tritex

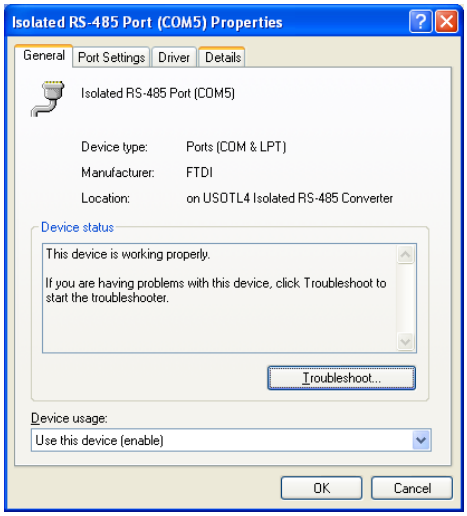
The Actuator uses an RS 485 hardware connection with a Modbus RTU protocol, therefore an adapter will be required to interface from the PC RS232 or USB port to the RS485 port. See Installation section for Details on the RS485 port.
If the PC has an RS-232 port, skip the device driver section below.

Device Drivers

If using a USB to 232 or USB to 485 converter it's device driver must be installed onto the PC. To verify the device driver has been installed and the device is recognized go to the PC Control Panel / System / Hardware/ Device Manager and expand the Port Settings to a dialog box similar to that below.

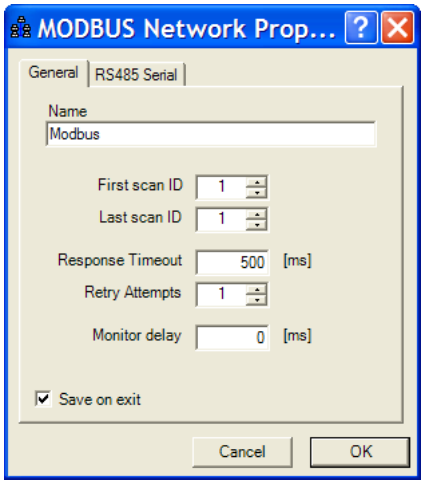


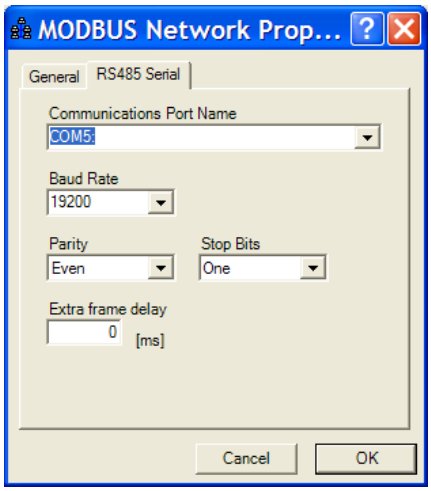
The Name of the device driver that has been installed must show under Ports, if it does not the Expert Software cannot connect to the PC COM port. Notice the COM#, COM5 in the example above; use this COM port number in the Expert Softer when setting up PC communication. Double Click on the COM Port to see the screen below to verify the converter's device driver is working.



Port Settings

First setup the Expert software to 'talk to' the pc communication port that is connected. From the Main Menu select Options / Network Communication Properties/Modus to view the port settings.





First and Last scan ID- define the Modbus ID the software will start and stop scanning. In the example above only ID 1 will be scanned. The default drive Modbus ID is 1. This setting will have to be hanged accordingly if an ID other than 1 is assigned to the drive.

Response Timeout- The Expert software will 'time out' if a response is not received from the drive within this time. (default 500 ms)

Retry Attempts- If a time out or other communications error occurs the software will attempt to send the same message, this sets the number of retry attempts.

Communications Port Name- This is the serial communication port number, if the PC has an RS232 port it is typically COM1 or COM2, if a USB converter is used the port number is typically 3-6, find the COM port number from the PC Device Manger screen see Communication between PC and Tritex above.

Baud Rate- The default baud rate of the drive is 19200. This setting and the drive setting must be the same. The Software does <u>not</u> attempt to make an 'auto' baud rate connection. If the drive setting is unknown different baud rates can be tried by changing this parameter.

Parity Stop Bits and Extra frame delay are set Even, One and 0 and must be left at this setting to communicate with the drive.

The Expert software saves the comport settings so as long as the same communication port is in used this step can be skipped in future online sessions.

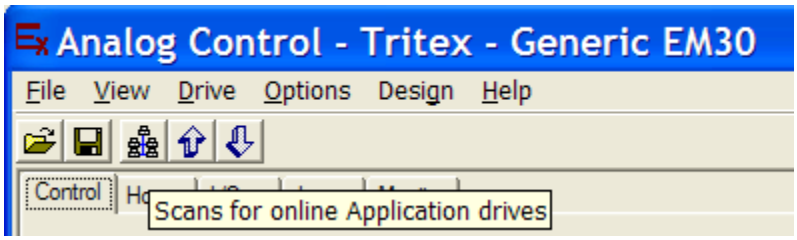
Online Operation

Open an Application

An application must be opened to establish an Online session with the drive. As long as the actual Drive Type matches the application drive type (EM30), the data in drive can be uploaded and viewed by the application. If the open application is different from the application used to create the drive file, the drive data is viewable in the application; however, the user units, actuator lead and specific application parameter names may not be displayed the same. For easiest operation and least confusion it is best (but not necessary) to upload the drive data into the same Application is it was downloaded with.
If the Application is unknown use the Quick Connect option on the Welcome screen to establish an online connection.

Connect to the Drive

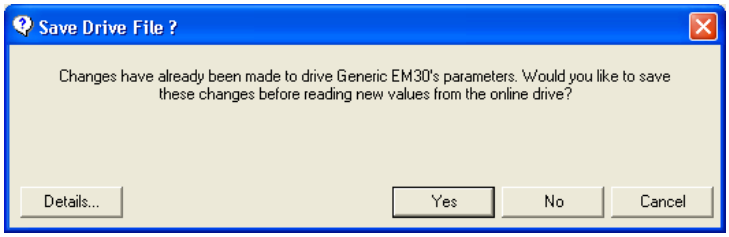
There are three ways to connect to the drive Scan for online drive, Upload, or Download.



Connect using the Scan for online drives Icon
Establishes communication, monitors status parameters and conditions, does not upload or download drive parameters. **Caution**: The page parameters shown on the screens may not match those in the drive until an upload or download has been performed.

Upload using the up arrow
Establishes communication and uploads all of the parameters from the drive to the PC to be displayed, changed or saved and stays online.

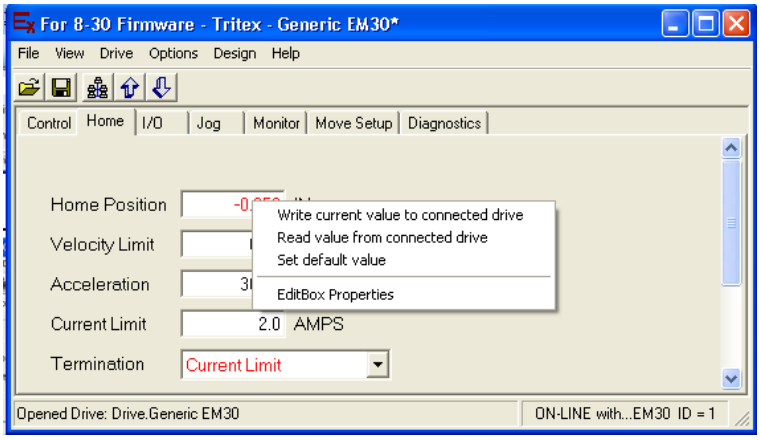
To avoid losing the current drive setup, perform an upload. The software will ask to save the current file, this is to allow the saving of the drive file that is open, so it is not lost when the drive file being uploaded overwrites it. The Expert software allows only one Application with one Drive File to be open at a time.


Save Drive File ?
Changes have already been made to drive Generic EM30's parameters. Would you like to save these changes before reading new values from the online drive?
Details...
Yes
No
Cancel

Download using the down arrow
Establishes communication and downloads all the drive parameters from the PC to the drive and stays online.

Now that the screens are indicating the drive parameter values, the drive can be programmed following the same steps as in the Offline operation.

Changing drive parameters: When a parameter on the screen is changed, the new value is generally not sent down to the drive, with the exception of parameters on the Jog tab, and screens used for calibration such and Tuning and the analog tabs. When a parameter is changed it can be sent to the drive by double clicking on the parameter or if a right click is performed an option dialog will pop up with action options for the parameter.
Important: When a parameter has been edited the focus must be removed from the parameter for the value to be accepted, either tab off the parameter or click on another parameter or press enter. If this is not done the value will not be downloaded.

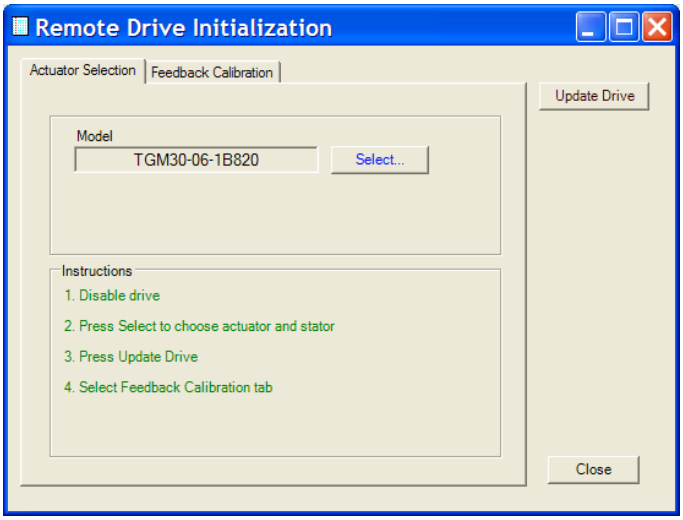


IMPORTANT-Saving parameters in the drive: Parameters are **not** saved into the drives non-volatile memory unless a download is performed. Individual Parameter changes only write to non permanent RAM memory, this means a download must be performed or the parameters will revert back to their previous value when logic power is cycled.

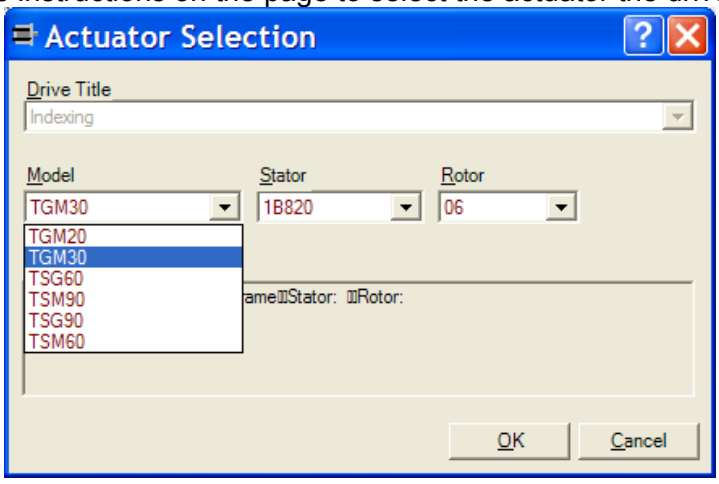
Initializing Remote Drive and Actuator combinations

The first time a specific TRA500 remote drive and actuator combination is used together the drive must be initialized with actuator parameters. When a remote drive and actuator pair is shipped together from the factory, this initialization is not required. This initialization is not available for embedded drive and actuator combinations.

1. Follow the directions above to open the desired application and drive file, and establish an on line connection.
2. From the Drive menu select *Initialize Remote Drive* and the following page will be displayed. *This option will only be displayed when online with a RTA500 drive.*



3. Follow the instructions on the page to select the actuator the drive is connected to.

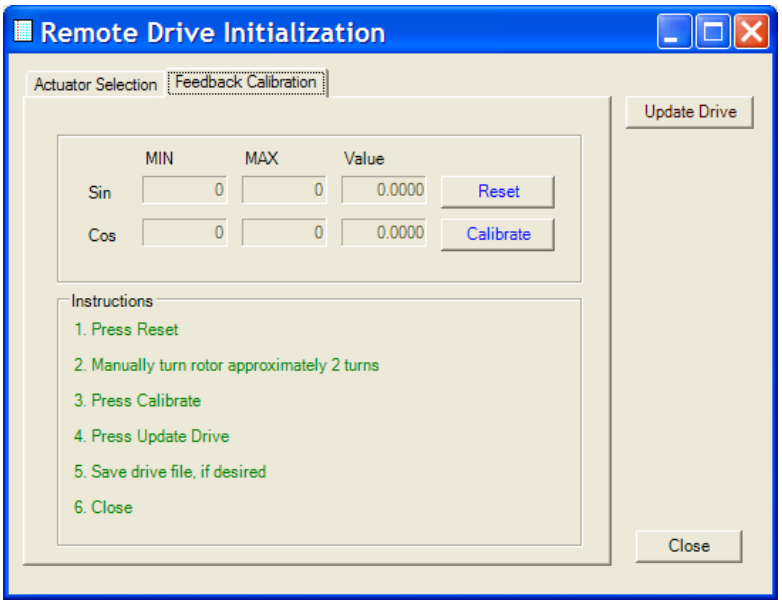


4. Select the Feedback calibrations tab

This tab is used to calibrate the feedback device in the actuator to the TRA500.This procedure requires moving the rotor of the actuator 1 or more turns, the easiest way to accomplish in most cases is to manually move the actuator with the drive disabled. It is only necessary to generate enough motion to turn the rotor proximally 2 turns. For TSM actuators with a lead of 0.5, 0.4 or 0.2, and the load disconnected, it is usually possible to back drive the rotor, for 0.1 lead, disconnect the anti-rotate and rotate the shaft until it is fully retracted then turn a couple extra turns to the rotor. For rotary actuators with high gear ratios it may not be possible to back drive the rotor, in this case the Tritex jog function can be used. It is recommended to disconnect the load because this method may cause a sudden motion.

CAUTION

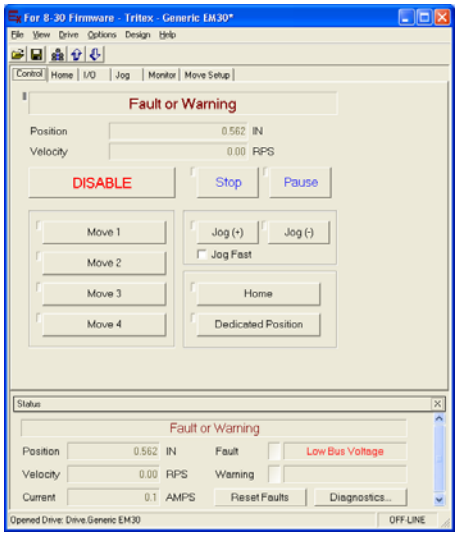
If it is necessary to use the Jog function to move the rotor, for the feedback calibration, the load should disconnected from the actuator as the motion maybe erratic and could cause damage to tooling.



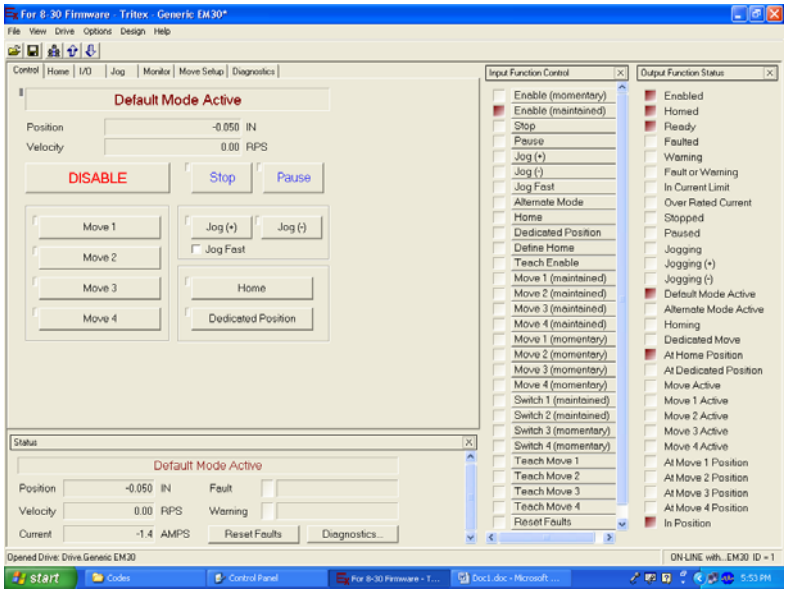
1. Press reset
2. Move the actuator 2 turns
3. Press calibrate, this calculates the new calibration parameters
4. Press Update drive this saves he calibration parameters in the drive's non-volatile memory.
5. If desired the Drive can be saved.
6. Close Remote Initialization

Online Status & Control

The Status window in the lower part of the screen and the Monitor and Diagnostics Tabs are very useful for observing drive operation. For more information on Status see the Online Diagnostic section.
The Control page can be used for starting and stopping motion directly from the screen



For advanced online control the Input Function Control page can be used to activate all input functions, providing total control from the pc. The Output Function Status page can be used to monitor the exact state, mode and motion type.

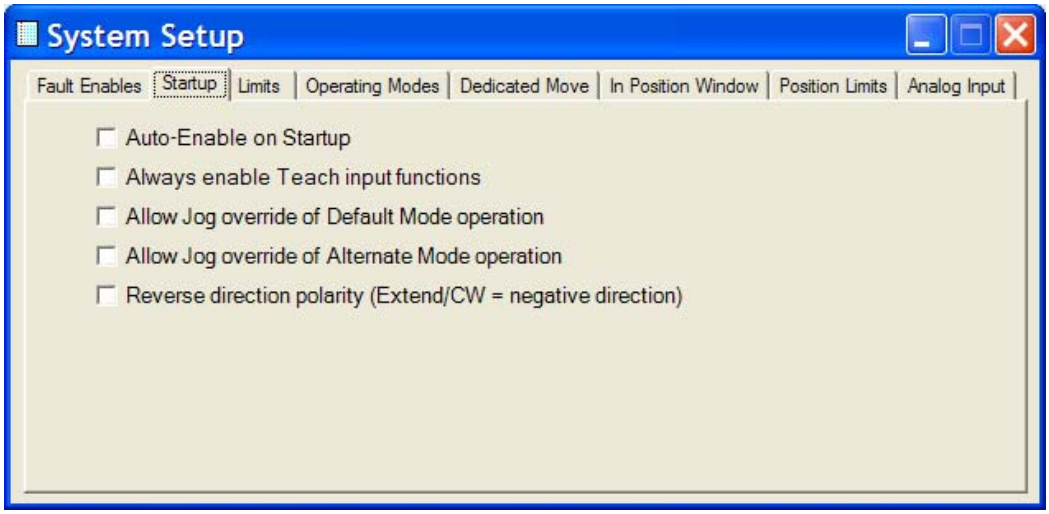


System Setup

System Setup

The System Setup page is separated into 8 tab groups containing various setup parameters.

Startup Tab



Auto-Enable on Startup- If checked the drive will automatically enable when logic and bus power are applied and after the Power Up Delay has expired (See Fault Enables tab), an Enable Maintained or Enable Momentary input function is not required.

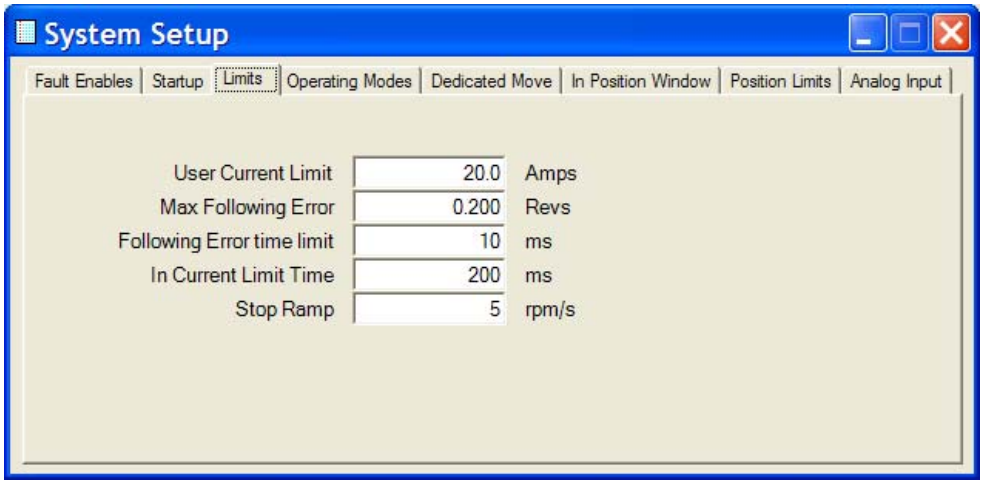
Always enable Teach input functions- If this box is checked the Teach function is always enabled, the Enable Teach Input Function is not required to teach a new position.

Allow Jog override of Default Mode operation - Allows the Jog motion to override other motion currently commanded from the Default Mode. For example if a Move or Analog Position, Velocity or Current motion is active from the Default Mode and a Jog motion is commanded, the Jog will take priority and override the Move. Jog will not override a Dedicated Move or Home motion.

Allow Jog override of Alternate Mode operation - Allows the Jog motion to override other motion currently commanded from the Alternate Mode. For example if a Move or Analog Position, Velocity or Current motion is active from the Alternate Mode and a Jog motion is commanded, the Jog will take priority and override the Move. Jog will not override a Dedicated Move or Home motion.

Reverse direction polarity (Extend/CW = negative direction)- Changes the polarity of movement for all commands and feedback (position,velocity and current). This is used to change the actuator direction without changing the commanded positions, velocities or torques. When this box is checked a negative command will move a linear actuator in the extend direction and a rotary actuator in the CW direction.
Note: Changing this flag changes the definition of all absolute positions and therefore automatically clears the Homed output function; a Home is required to resume operation.

Limits Tab



User Current Limit- The parameter limits the maximum current available from the drive. This parameter will be effective only if it is set below the allowable current for the drive/motor combination in use. If Host Mode is active the current limit in Host Mode overrides this System Current Limit. The Current Limits in Home Move and Feed Move override this System Current Limit during those motions.

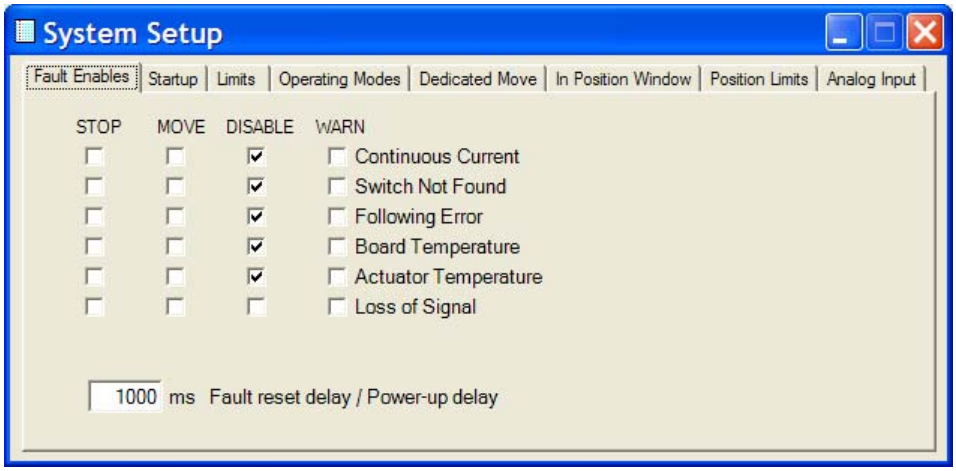
Max Following Error- This sets the maximum allowable following error (commanded position – actual position) before an error is detected. This condition can be set by the user as a fault or warning (see Faults tab). The condition is monitored for position and velocity motion types, not in current/torque motion types.

Following Error Time Limit – The allowable time a Following Error will exist before an error event actually occurs.

In Current Limit Time- Sets the amount of time the current limit is active before triggering the current limit Output Function and also applies to the internal Current Limit event. For example if the Homing Current Limit is set 5 amps the drive will limit the current to 5 amps during Homing cycle, if the Home termination is set to Current Limit, the drive will have to supply 5 amps for this specified time before the termination is satisfied (also applies to Feed Moves).

Stop Ramp- This deceleration ramp will be used when a Stop function is activated.

Fault Enables



CAUTION

This feature allows the user to select the action taken by the drive for various fault conditions. Selecting Disable means the drive is immediately disabled for drive, motor and customer tooling protections. If selections other than DISABLE are chosen it is up to the user to disable the drive as soon as possible if any of these conditions occur. Failure to act on these conditions could cause permanent damage to the drive or motor/actuator.

The action generated from a fault condition can be selected.
WARN- causes a warning status and the Warning Output function to be active, the Warning will clear when the fault condition clears.

DISABLE- causes the drive to disable (remove power from the motor) for the selected fault. The drive must be re-enabled after the fault condition has cleared. Re-enabling after fault does not happen automatically. The Fault reset delay does not apply because an auto-reset is not allowed when Disable is selected.

MOVE- causes the Dedicated Move to activate, this will start to move the motor/actuator to the Dedicated Move Position. If the fault condition clears and the Fault reset delay completes before the move is complete, normal operation will be continued. (See Dedicated Move tab on this page.)

STOP- Issues a Stop command to stop motion, motion will restart when the fault is cleared and the Fault Reset Delay has expired.

If more the one action is selected the following sequence is followed.
1. Warning, 2.Move, 3. Stop, 4. Disable
Example: MOVE and DISABLE are both checked for a Loss of Signal fault. First the move to Dedicated Position would take place, when it is done the drive will disable.

Fault reset delay / Power-up delay- This time delay is used under 2 conditions, the delay is added after power up before the drive is allowed to enable and also a delay before automatically recovering from a fault condition, when DISABLE is not selected.

Fault Recovery: If DISABLE is checked there is no automatic recovery, the fault is latched and the drive will remain disabled until a reset occurs or the drive is re-enabled. If disable is not checked the drive will automatically recover when the fault condition is cleared and after the Fault reset delay.
Example: The delay is set 3000 ms (3 sec), the Loss of Signal fault is selected to perform a STOP, on a Loss of Signal condition the Stop mode would immediately be activated and remain until the Loss of Signal condition is rectified, then after a 3 second delay, operation would be allowed to continue.

Continuous Current- The drive continuously monitors the drive power on an I^2t calculation and comparing actual value to the factory limit. Under most conditions this is set to DISABLE.

Switch Not Found- This condition can occur in both Home and Feed Move motion types, if the Termination Type is set to Switch (1-4) and the Current Limit for the motion is hit before the Switch Input is sensed (Feed Move also requires the "Fault on Current Limit box to be checked, see the Move page).

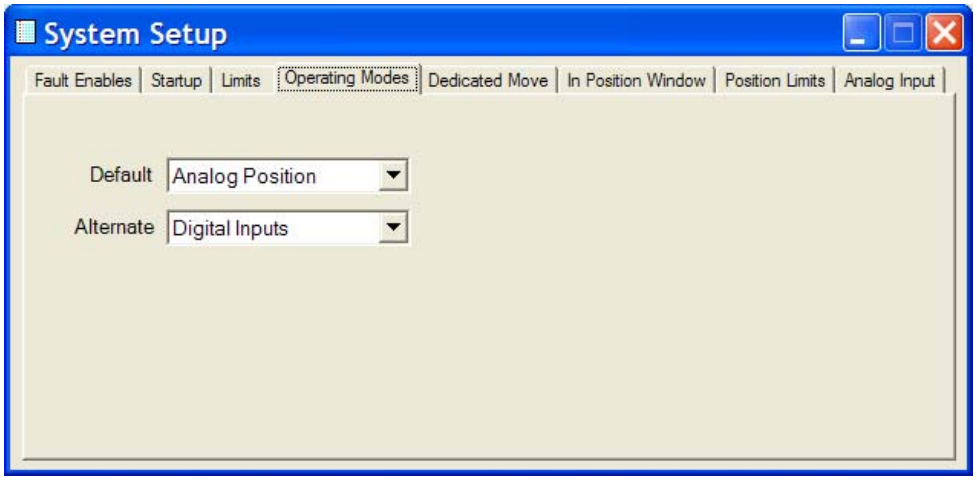
Following Error- This condition occurs if the Positional Error and Time Limit are exceeded.

Board Temperature- This condition occurs when the drive board temperature sensor is over 80 Deg C. Disabling this fault could cause permanent damage to the drive.

Actuator Temperature- This condition occurs when the temperature sensor in the stator winding is open, indicating the temperature over 130 Deg. C. Disabling this fault could cause permanent damage to the motor winding.

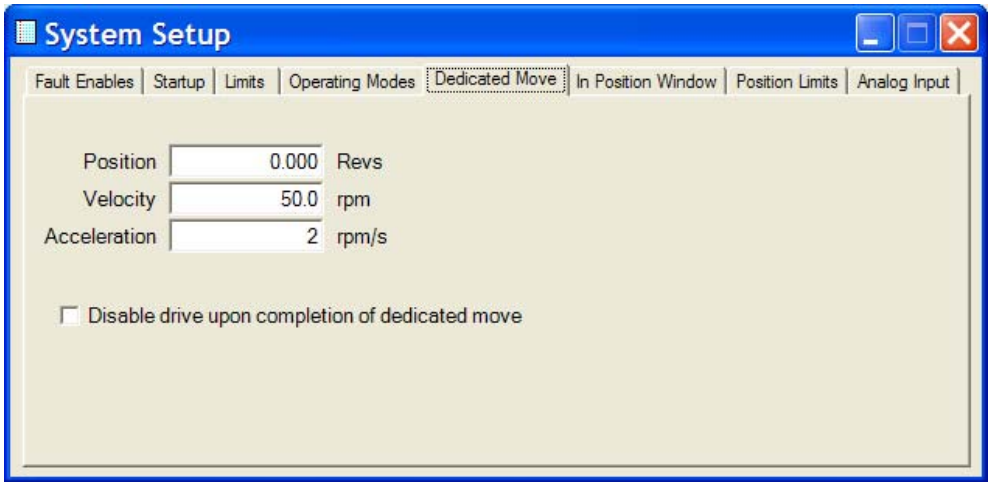
*Loss of Signa*l- This condition occurs only when the mA Analog Input mode is selected and the actual analog input value is less than 2 mA.

Operating Modes



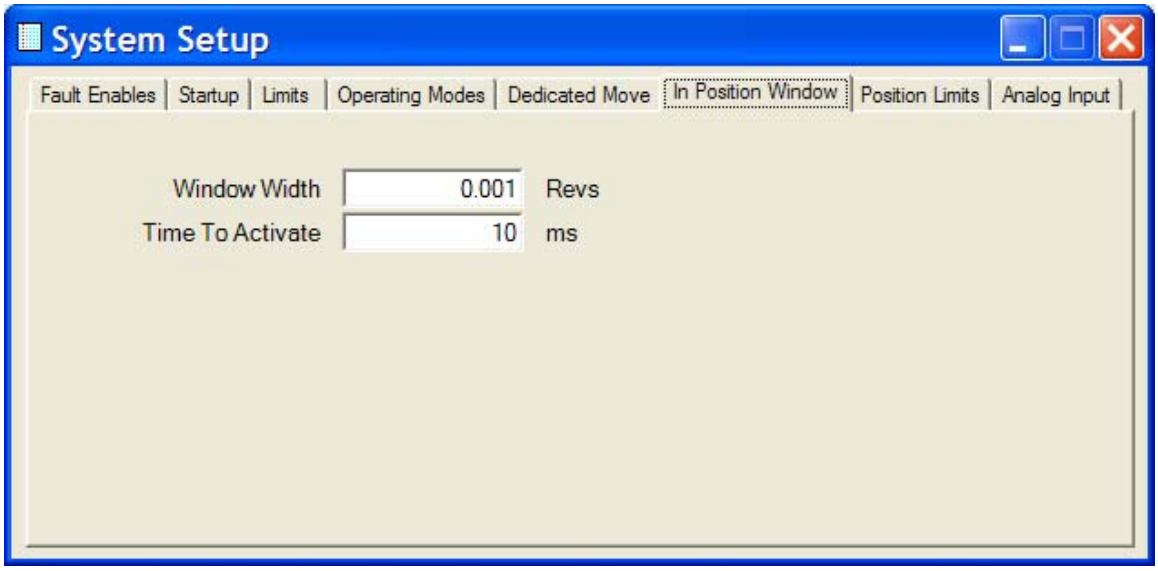
This tab allows selection of the source / motion type for Default and Alternate Modes. The possible selections for each mode include: Inactive, Digital I/O, Analog Position, Analog Velocity or Analog Current.

Dedicated Move



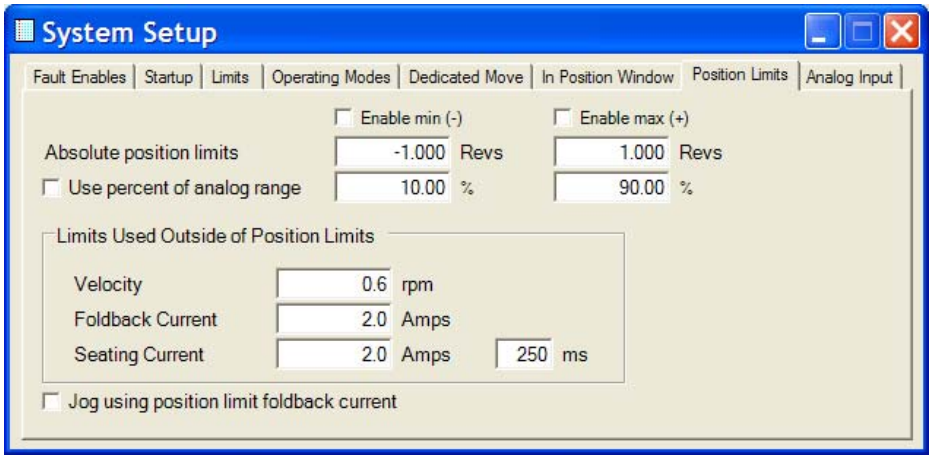
The Dedicated Move is designed to provide a method, available from any mode, to Move to a specified position. The Dedicated Move has priority in all operating modes. For example if the current Operating Mode is Alternate and the motion type is Analog Position when the Dedicated Move Input Function goes active the Alternate Move will become active, even though Digital Input Mode is not active. When the Alternate Mode Input Function is switched back to inactive the Mode will revert back to Analog Position.
Disable drive upon completion of dedicated move check box allows a method of automatic shut down at the completion of the move. The drive must be re-enabled to resume operation.
Note: The Dedicated Move Position is an absolute position, therefore a Home cycle must be completed (Homed Output Function on), before a Dedicated Move will be allowed to execute.

In Position Window

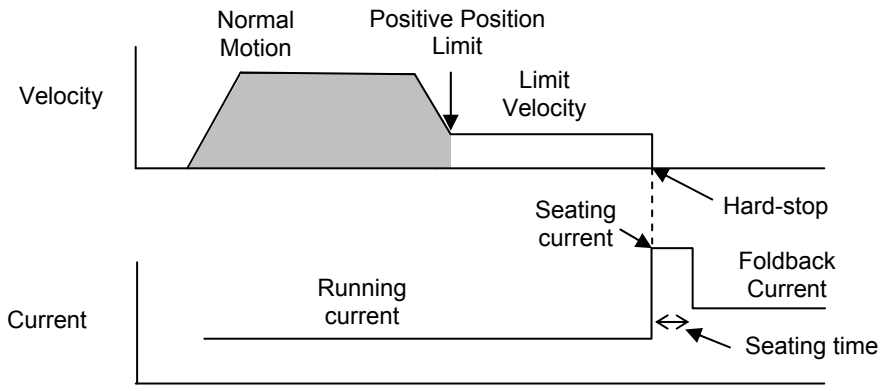


The In Position Window defines the window and time delay used by the At Home Position, At Dedicated Move Position, At Move (1-4) Position and In Position Output Functions. The window width is actually +/- the value entered, for example if the 0.005 inches is entered the actual position must within + or – 0.005 inch of the commanded position. The 'in position' condition is satisfied when the commanded position - actual position is within the window AND remains there for the specified by Time To Activate, AND the commanded velocity is zero.
Note: In Analog Positioning Mode the commanded velocity is usually changing continuously, dithering in position, therefore the commanded velocity is rarely zero for very long so the In Position Output function will continually cycle on and off.

Position Limits



Position Limits are software monitored travel limits with special features for control outside of the travel limits.
The limits can be enabled individually for each direction during all modes of motion. The controller looks ahead to anticipate when/if the position limit will be hit based on the current velocity at approximately a 2msec scan rate. If it is determined the limit will be reached the control decelerates using the acceleration/deceleration rate for the active mode. Once the commanded position is outside of the position limit range the Velocity, Foldback Current and Seating Current parameters take effect. The motion control while outside of the position limits operates in a special mode to limit velocity and the current. If the velocity is set to zero, motion will stop near the limit position, if is non zero the motor will ramp to the limit velocity, without stopping, looking for a hard-stop. When the hard stop is hit the seating current will be produced for the specified time and then the current will be switched to the foldback current value. During this Position Limit mode of operation the following error does not build up when a hard stop is reached, the following error is controlled to maintain the desired current limit. The limits are direction sensitive, meaning that velocity and current are only limited in the direction of the active position limit, any motion commanded in the opposite direction will operate normally. Exception: If the mode of operation is Analog Torque or Host Current Mode the velocity limit will not be in effect, the seat and foldback current limits are active.
Note: Position Limits are only active after a home has been completed.



Position Limit Parameters

Enable Min (-) and Max (+)- Select the direction in which the limit parameters are active.

Absolute Position Limits- Set the position in user units where the limits become effective, since they are absolute a home must be completed before they will take effect.

Use percent of analog range- This option is normally used if the position mode is analog position and the user desires to base the position limits on the percent of the analog position min and max settings. If this box is checked the percent of analog input command will be used instead of the absolute position limits for example in a valve application.

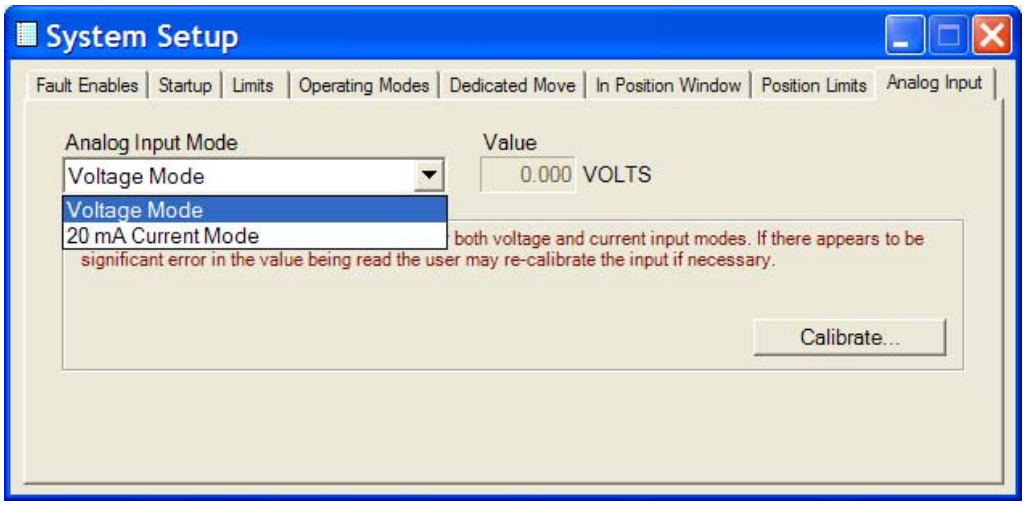
Limits Used Outside of Position Limits- These limits take affect when the commanded position is outside of the Position Limit parameter values.

Velocity- This is the velocity limit in user units. If set to zero the motor / actuator will stop near the position limit. If set to a non zero value, the velocity will be ramped to this velocity at the position limit position.

Foldback Current- The current will be limited to this value when the commanded position is outside of the position limit range and seating current limit has been reached and the time has expired.

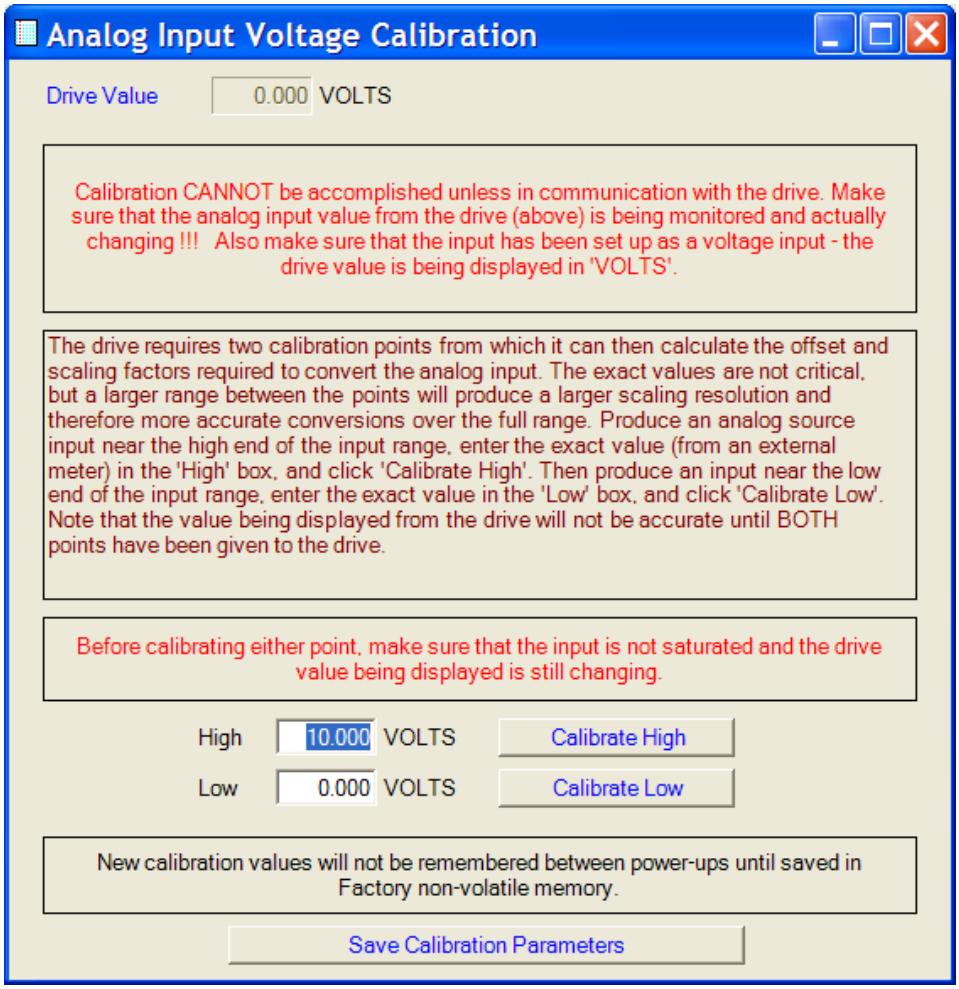
Seating Current Limit- If a hard stop is hit while outside of the position limit range the current will built to this value for the specified time. When the time has expired Foldback current will take effect. If it is not desired to have extra current for seating this value should be set equal to the Foldback current.

Analog Input Calibration



The analog input for voltage and 20mA mode are calibrated at the factory, if there appears to be error in the value being read the user may re-calibrate the input if necessary. To calibrate, first select the mode to calibrate, Voltage Mode or 20mA Current Mode, then click the calibrate button. The Analog Input value is displayed in the units of the selected mode. The parameter is only available with firmware revision 2.0 or higher.

Analog Input Calibration


Analog Input Voltage Calibration
Drive Value
0.000 VOLTS
Calibration CANNOT be accomplished unless in communication with the drive. Make sure that the analog input value from the drive (above) is being monitored and actually changing !!! Also make sure that the input has been set up as a voltage input - the drive value is being displayed in 'VOLTS'.
The drive requires two calibration points from which it can then calculate the offset and scaling factors required to convert the analog input. The exact values are not critical, but a larger range between the points will produce a larger scaling resolution and therefore more accurate conversions over the full range. Produce an analog source input near the high end of the input range, enter the exact value (from an external meter) in the 'High' box, and click 'Calibrate High'. Then produce an input near the low end of the input range, enter the exact value in the 'Low' box, and click 'Calibrate Low'. Note that the value being displayed from the drive will not be accurate until BOTH points have been given to the drive.
Before calibrating either point, make sure that the input is not saturated and the drive value being displayed is still changing.
High
10.000 VOLTS
Calibrate High
Low
0.000 VOLTS
Calibrate Low
New calibration values will not be remembered between power-ups until saved in Factory non-volatile memory.
Save Calibration Parameters

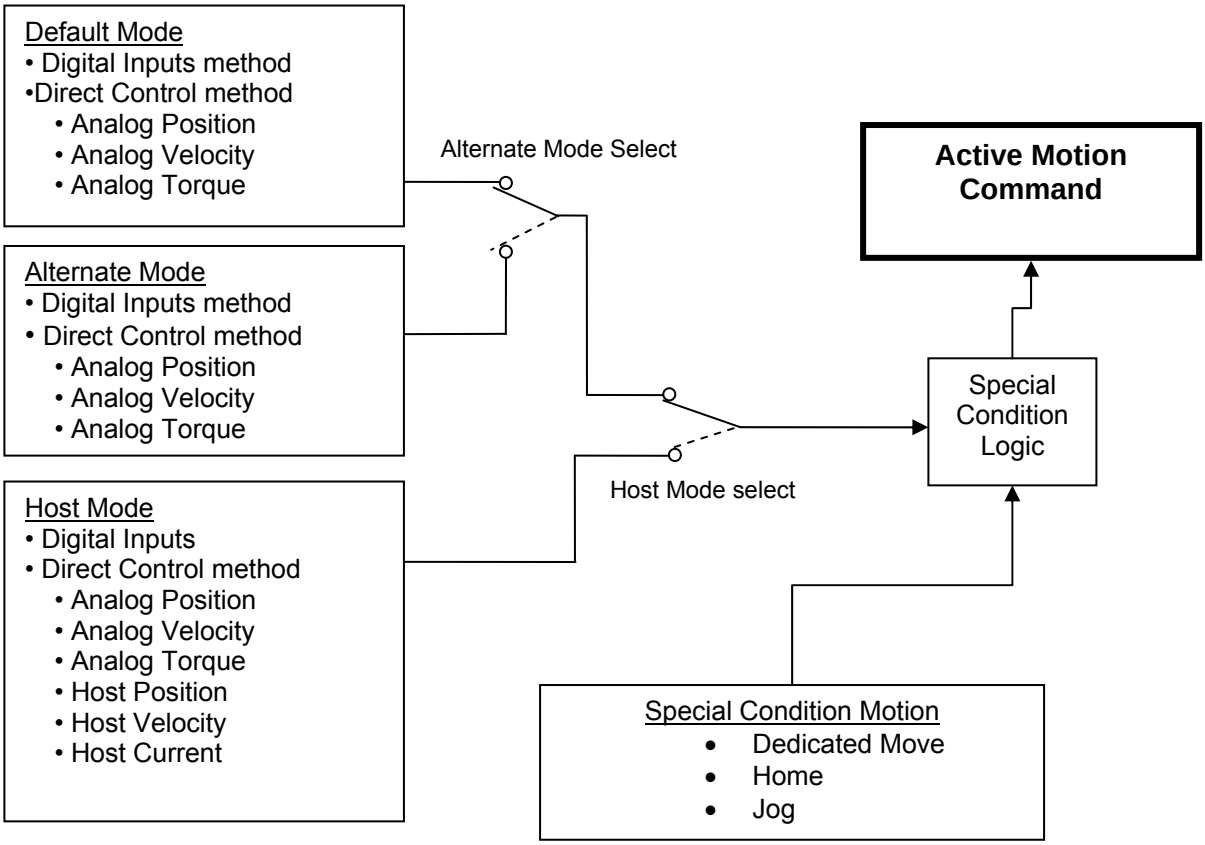
Calibration can only be performed when online with drive. This Calibration is intended to match the drive value with a value read by and external meter.
Follow the step by step instructions on the screen. This feature is only available with firmware 2.0 or higher.

Important: The newly calibrated numbers are not saved in the drive non-volatile memory until the Save Calibration Parameters button is clicked.

Motion Control

Motion Control Overview

There are two basic methods to control motion, via digital inputs or via direct control of position, velocity or torque. The Digital Input method can control Jog, Move, Dedicated Move and Home motion types. The direct method can control position, velocity or torque directly from either an analog command or a host command. These motion control types are available in three modes Default Mode, Alternant Mode and Host Mode. To provide additional flexibility and ease of use Dedicated Move, Home and Jog motion types are available under certain conditions even if Digital Inputs is not the selected move methods.



Default & Alternate Mode

Default and Alternate can each be assigned a motion type with only one type active at a time. Digital Inputs, Analog Position, Velocity and Torque can be selected for each. Default is the normally the active mode and Alternate Mode can be selected via an Input or via Modbus. For example if Digital Input mode is selected as default and Analog Position is selected for Alternate, Indexing can be performed using the Move Input functions and as soon as the Alternate Mode Input function is active the controller will switch to Analog Position Mode.

Host Mode

Host Mode can only be selected via Modus commands. Host Mode allows the same motion types as the other modes plus Host Position, Velocity and Torque.

Special Condition Motion

The Special Condition Logic allows certain motion types to be activated from Input Functions even if Digital Input Mode is not the currently selected mode.

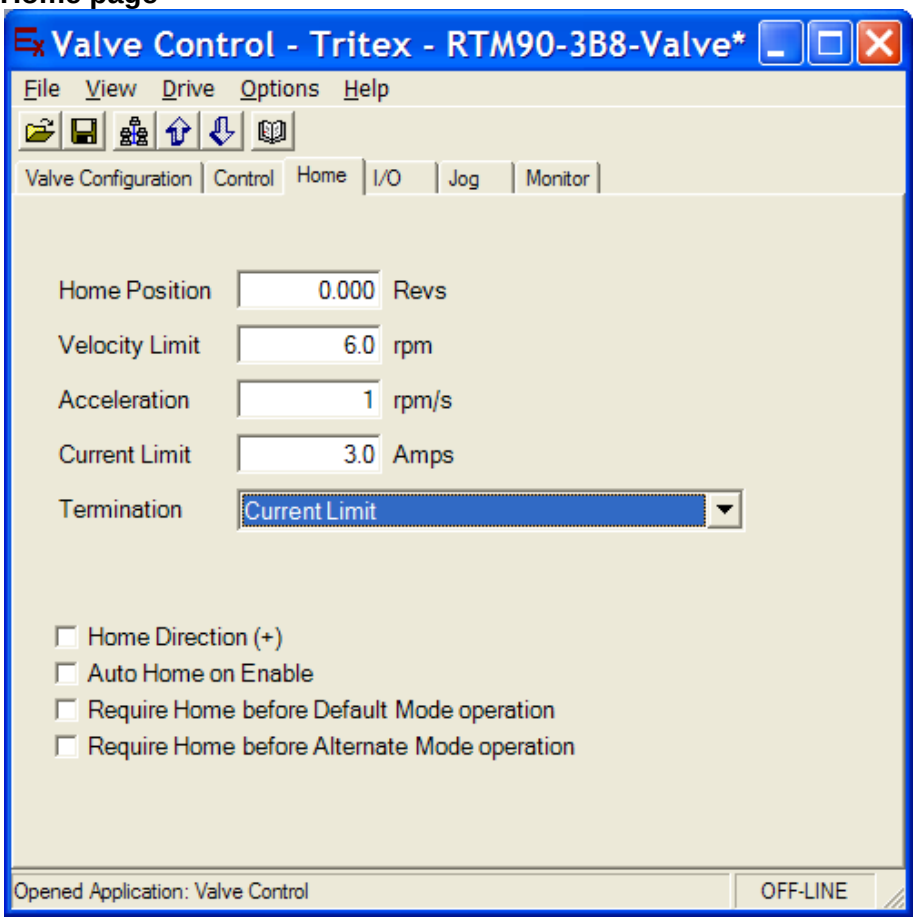
Dedicated Move: If the Dedicated Move Input Function is activated from an Input or Modbus it will override any active motion from any mode, except a Home motion. As soon as the function is deactivated the motion type will revert to the active mode. A Home cycle must be completed (Homed Output Function on) before a Dedicated Move will be allowed.

Home Cycle: If a Home cycle has not been completed a Home can be initiated from an Input or Modbus address even if Digital Inputs is not the active Mode. Once the Homed Output Function is active an subsequent Home cycle can only be activated when Digital Input Mode is active.

Jog: If the Allow Jog Override on Default Operation Mode or Allow Jog Override on Alternate Operation Mode check box is checked Jog motion will override the active motion when the Digital Input Mode is not active. (See Startup section of the System Startup page for details)

Home Operation

Home page


Valve Control - Tritex - RTM90-3B8-Valve*
File View Drive Options Help
Valve Configuration Control Home I/O Jog Monitor
Home Position 0.000 Revs
Velocity Limit 6.0 rpm
Acceleration 1 rpm/s
Current Limit 3.0 Amps
Termination Current Limit
Home Direction (+)
Auto Home on Enable
Require Home before Default Mode operation
Require Home before Alternate Mode operation
Opened Application: Valve Control
OFF-LINE

Home parameters

Home Position: The commanded and actual position are set to this position at the completion of a Home cycle.

Velocity Limit: The Home move maximum velocity. This may or may not be achieved depending on the distance before home reached and the Acceleration parameter.
Acceleration: The acceleration ramp used during a home move

Current Limit: This sets the current limit for the Home move. If the Termination is set to Current Limit, the Home move will end when the Actual Current is equal to or greater than this value. If Termination is set to Sw 1-4 and the Current Limit Value is exceeded before a switch is found a *Switch is Not Found Fault* will occur. (see Faults & Warning)
Note: If the Current Limit is set to create a fault if the switch is not found, do not select both Auto Home on Enable and Auto Enable on Startup (System Setup page). If the Actuator is against a stop in the home direction, each time the fault is attempted to be cleared another home against the stop is executed creating another fault.

Termination: This action will end the Home move and define the actual home position as entered in the *Home Position* parameter, options are Current Limit, or Switch 1-4 input functions or Current Limit AND Switch 1-4 input functions.

Home Direction: Select plus or minus direction, minus is the default.

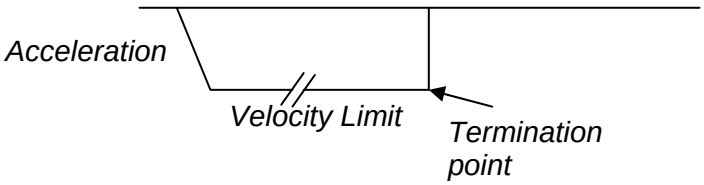
Auto Home on Start Up: Selects if a Home operation if automatically performed on power-up.

Require Home before Default command operation: If checked requires a Home to be completed before operation from the Default Command Mode operation.
Require Home before Alternate command operation: If checked requires a Home to be completed before operation from the Default Command Mode operation.

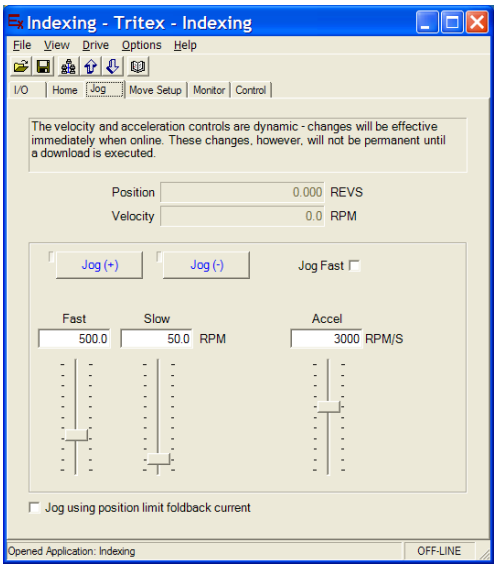
Home operation:
The Home function can be initiated from the following methods:

1. The Home Input function from either an assigned digital input
2. Input Function Control Page
3. Home button on the Control Page
4. From a host using Modus address control.
5. Automatically Home when the actuator is enabled, if the Homed status in not active.

Once initiated the *Acceleration* rate will be followed to achieve the *Maximum Velocity.* The Home Termination selection is poled at a 2 msec rate looking for *Termination* condition to be satisfied, This is where the *Home Position* is determined to be and the motor is immediately stopped.
When the home is complete the Home Current limit is removed and the default Current Limit the System Setup page is activated.



Jog


Indexing - Tritex - Indexing
File View Drive Options Help
I/O Home Jog Move Setup Monitor Control
The velocity and acceleration controls are dynamic - changes will be effective immediately when online. These changes, however, will not be permanent until a download is executed.
Position 0.000 REVS
Velocity 0.0 RPM
Jog (+)
Jog (-)
Jog Fast
Fast
Slow
Accel
500.0
50.0 RPM
3000 RPM/S
Jog using position limit foldback current
Opened Application: Indexing
OFF-LINE

Jog Parameters

Jog Slow: The Jog speed when the Fast Jog is not selected

Jog Fast: The Jog speed when the Fast Jog is selected

Jog Acceleration: The Acceleration and Deceleration ramp used in Jog Mode

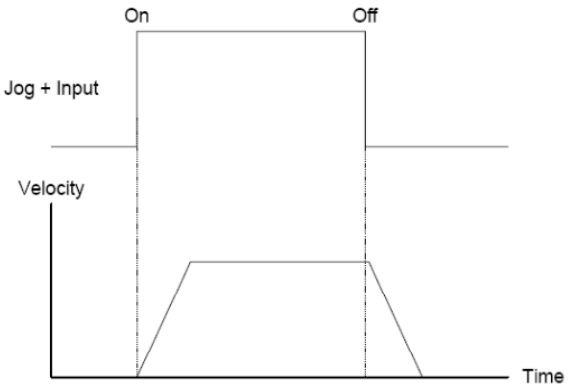
Jog Controls

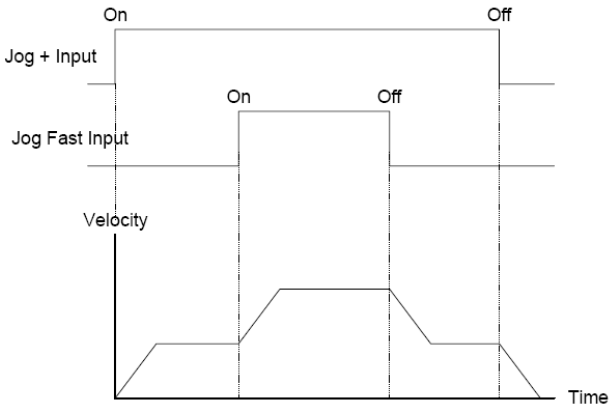
Jog Fast, Slow and Acceleration slider bars provide easy change of jog parameters that take effect immediately but are not save permanently unless a download is performed. The Jog (+) an d Jog (-) buttons will activate a Jog as long as they held down with a mouse click. The indicators next to the buttons illuminate when the Jog is active.

Jog Fast Check Box or Input Functions selects the Jog Fast velocity.

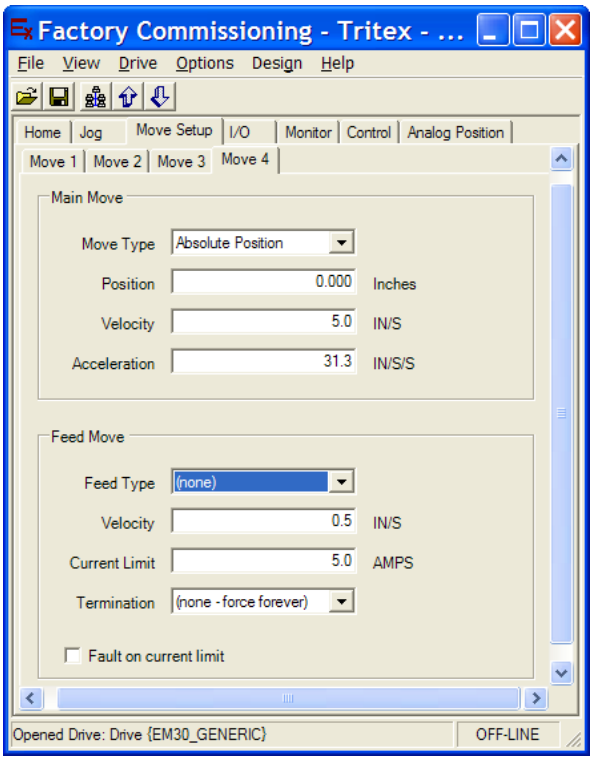
Jog using position limit foldback current- This flag limits the available current when a Jog motion is active to the Foldback Current value set on the Position Limit tab of the System Setup page. Can be used to find hard-stop positions or limit available torque/force during manual operation.

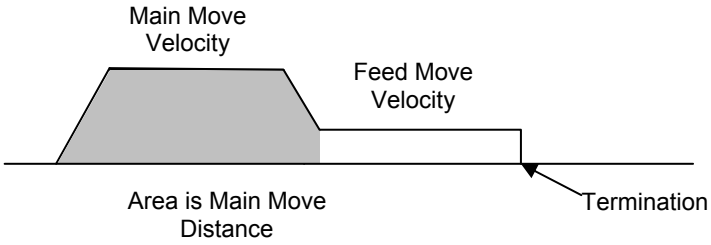
The Jog function can be initiated from the Jog +/- Input functions which can be activated from either the assigned digital inputs, Input Function Control Page, Jog buttons on the Jog Page or the Control Page, or from the Modus addresses. Jog can be selected to override other motion types see the System Setup page description and Motion Description.





Move


Factory Commissioning - Tritex - ...
File View Drive Options Design Help
Home Jog Move Setup I/O Monitor Control Analog Position
Move 1 Move 2 Move 3 Move 4
Main Move
Move Type Absolute Position
Position 0.000 Inches
Velocity 5.0 IN/S
Acceleration 31.3 IN/S/S
Feed Move
Feed Type (none)
Velocity 0.5 IN/S
Current Limit 5.0 AMPS
Termination (none - force forever)
Fault on current limit
Opened Drive: Drive {EM30_GENERIC}
OFF-LINE



The Tritex is capable of storing and controlling up to 4 move profiles. Each move has 2 parts a *Main Move* and a *Feed Move.* The *Main Move* transitions into the *Feed Move* without coming to a stop. If (none) is selected for the Feed Type move the move is complete at the end of Main Move.

Move Parameters

Move Type: provides selection for the type of move, Absolute Position will move to the desired position relative to home. Absolute (+ dir only) and Absolute (- dir only) will move to the desired position relative to home only if the position is more positive or more negative than the current position. Incremental Move will move the specified distance each time the move is initiated. If Incremental move type is selected, do not use the Move Maintained Input Function because as soon as the move is complete, another one will immediately start. Move Momentary Input Function should be use for Incremental type moves.

Main Move:

Position: Defines the move position or distance specified in User Units.

Velocity: Defines the velocity of the move in user units

Acceleration: Defines the Acceleration and Deceleration of the move in User Units

Feed Move:

Feed Type: Selects the direction of the Feed Move, (none) designates that no feed move will be executed, Feed (+) selects the Feed portion of the will move in the positive direction until termination. Feed (-) selects the Feed portion of the will move in the negative direction until termination.
Current Limit: Sets the current limit for the Feed portion of the Move.
Termination: This is the action that will end the Feed portion of the move, options are Current Limit, or *Switch 1-4 input functions*. Termination causes a rapid stop, no deceleration ramp is used.
Fault on current limit check box: If the box is checked and Termination is set to Sw 1-4 and the Current Limit Value is exceeded before a switch is found a *Switch is Not Found Fault* will occur. (see Faults & Warning)

Analog Motion Control

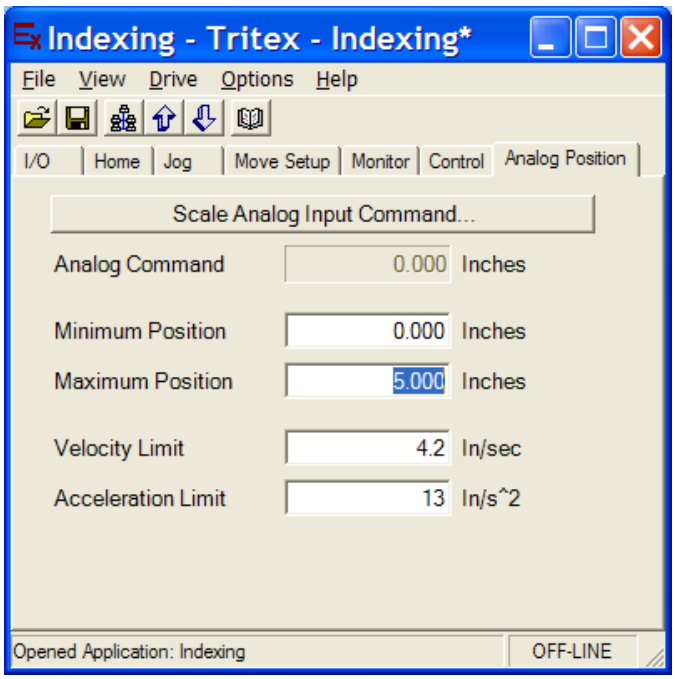
Analog Input

The Analog Input can be setup as a position command, a velocity command or a current command, the Expert Software provides a page for each, with the specific parameters need for each type of motion control.

Analog Position Control

Analog Position Control provides position control proportional to the analog input value, the input is continuously updated and scaled to provide an Analog Command position, if the Analog Position Control is active from Default, Alternate or Host Modes the drive will position to the command while following the Velocity and Acceleration limits as specified on the page. The Acceleration Limit is also used as the deceleration limit.

Analog Positioning


Indexing - Tritex - Indexing*
File View Drive Options Help
I/O Home Jog Move Setup Monitor Control Analog Position
Scale Analog Input Command...
Analog Command 0.000 Inches
Minimum Position 0.000 Inches
Maximum Position 5.000 Inches
Velocity Limit 4.2 In/sec
Acceleration Limit 13 In/s^2
Opened Application: Indexing
OFF-LINE

Parameters

Analog Command- Displays the commanded position in user units based on the analog input value and the scaling.

Minimum Position- This should be set to the desired motor / actuator position in user units when the analog input is at the Minimum value. (see Analog Input Scaling)

Maximum Position- This should be set to the desired motor / actuator position in user units when the analog input is at the Maximum Calibrated value. (see Analog Input Scaling)

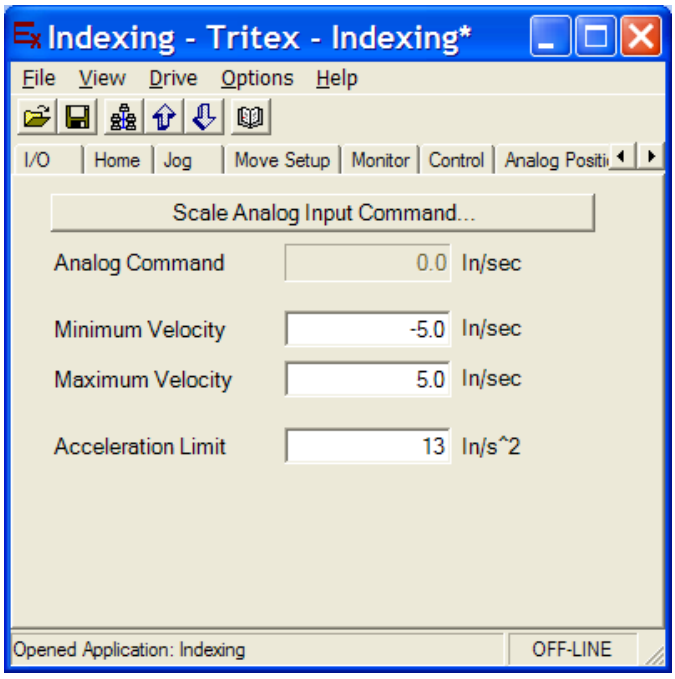
Velocity Limit- The maximum velocity during Analog Positioning, regardless of the analog input change.

Acceleration Limit- The maximum acceleration and deceleration during Analog Positioning regardless of the analog input rate of change.

Analog Velocity Control

Analog Velocity Control- Provides velocity control proportional to the analog input value, the input is continuously update and scaled to provide an Analog Command velocity, if the Analog Velocity Control is active from Default, Alternate or Host Modes the drive will operate as velocity control following the Acceleration limit as specified on the page. The Acceleration Limit is also used as the deceleration limit. In Analog Velocity Mode, position control is the responsibility of the users control system.

Analog Velocity Page


Indexing - Tritex - Indexing*
File View Drive Options Help
I/O Home Jog Move Setup Monitor Control Analog Positi
Scale Analog Input Command...
Analog Command 0.0 In/sec
Minimum Velocity -5.0 In/sec
Maximum Velocity 5.0 In/sec
Acceleration Limit 13 In/s^2
Opened Application: Indexing
OFF-LINE

Analog Command- Displays the commanded velocity in user units based on the analog input value and the scaling.

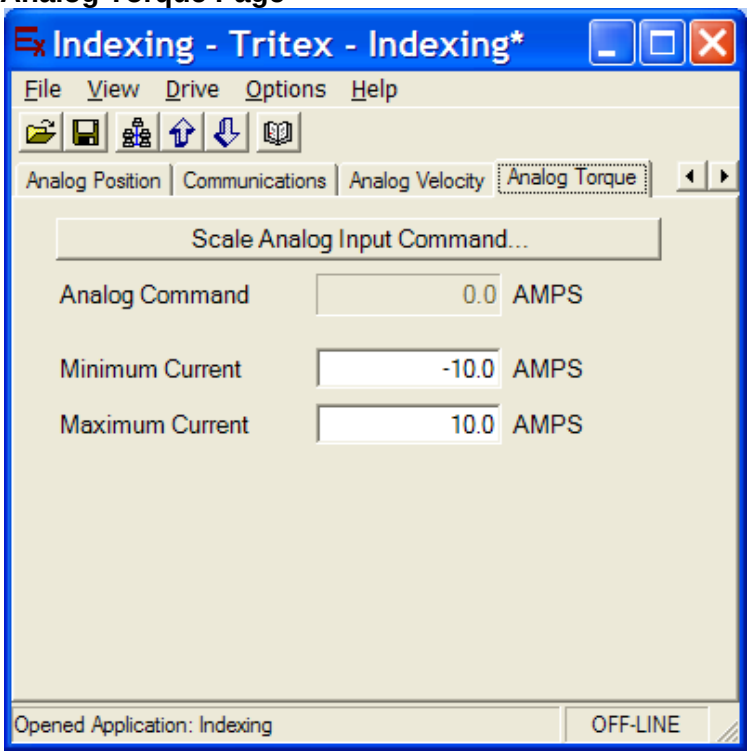
Minimum Velocity- This should be set to the desired motor / actuator velocity in user units when the analog input is at the Minimum value. (see Analog Input Scaling)

Maximum Velocity- This should be set to the desired motor / actuator velocity in user units when the analog input is at the Maximum value. (see Analog Input Scaling)

Acceleration Limit- The maximum acceleration and deceleration during Analog Positioning regardless of the analog input rate of change.

Analog Torque Control
Analog Torque Control provides current control based on the analog input value, the input is continuously update and scaled to provide an Analog Command current, if the Analog Current Control is active from Default, Alternate or Host Modes the drive will operate as torque / force control. In Analog Current control velocity and position control are the responsibility of the users control system.

Analog Torque Page



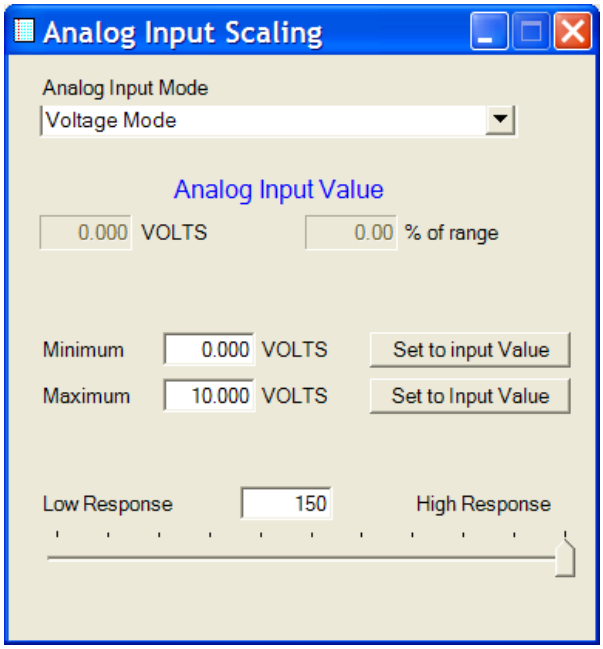
Minimum Current- This should be set to the desired motor / actuator current in Amps when the analog input is at the Minimum value. (see Analog Input Scaling)

Maximum Current- This should be set to the desired motor / actuator Amps when the analog input is at the Maximum value. (see Analog Input Scaling)

Analog Input Calibration
The analog input is calibrated at the factory; if the calibration does not match values seen in the installation the user can adjust the factory calibration see System Setup, the Analog Input tab.

Analog Input Scaling

The analog input can be configured for either voltage mode (0- 10V) or current mode (0-20 mA). Analog input scaling is provided to allow scaling the actual available analog input range to the range of the drive's analog inputs range. These minimum & maximum values will correspond to the Minimum and Maximum commanded Position, Velocity or Currents on the corresponding Analog Position, Velocity & Torque pages.

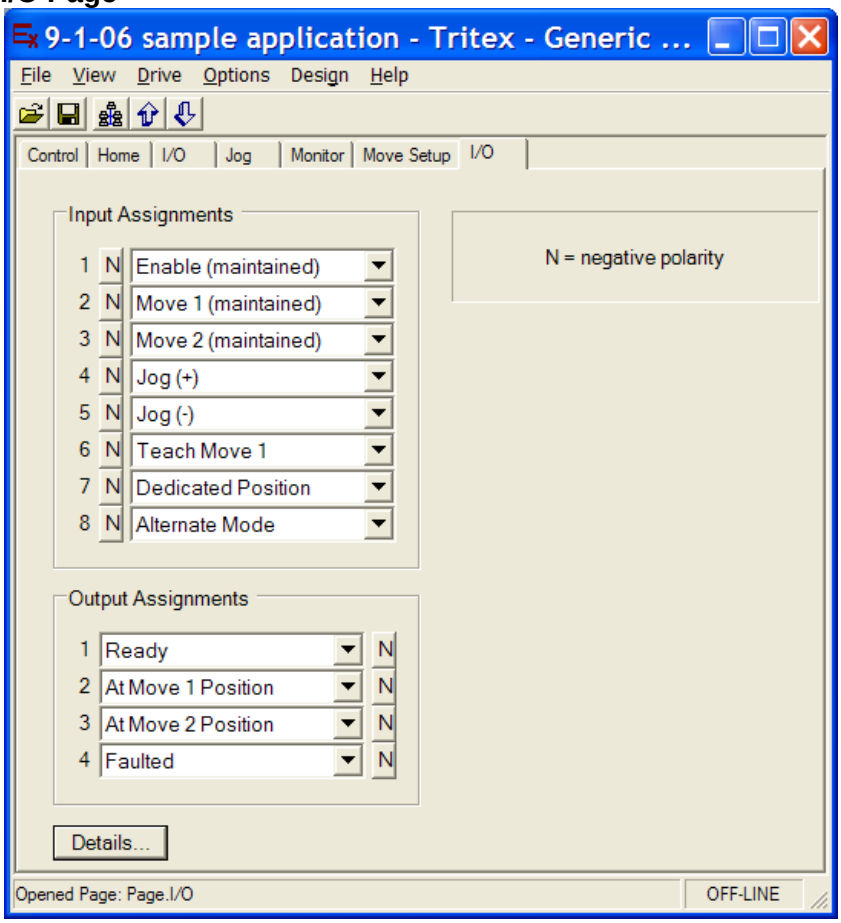


On line scaling: When on line with the drive the scaling can be set automatically by the drive. First apply the minimum analog input (4mA for example) and activate the Minimum Set to Input Value button. Next apply maximum analog input (20mA for example) and activate the Maximum Set to Input Value button.
A download must be performed to save the values in the drives non-volatile memory.

Inputs and Outputs

Digital I/O

I/O Page


9-1-06 sample application - Tritex - Generic ...
File View Drive Options Design Help
Control Home I/O Jog Monitor Move Setup I/O
Input Assignments
1 N Enable (maintained)
2 N Move 1 (maintained)
3 N Move 2 (maintained)
4 N Jog (+)
5 N Jog (-)
6 N Teach Move 1
7 N Dedicated Position
8 N Alternate Mode
N = negative polarity
Output Assignments
1 Ready N
2 At Move 1 Position N
3 At Move 2 Position N
4 Faulted N
Details...
Opened Page: Page.I/O
OFF-LINE

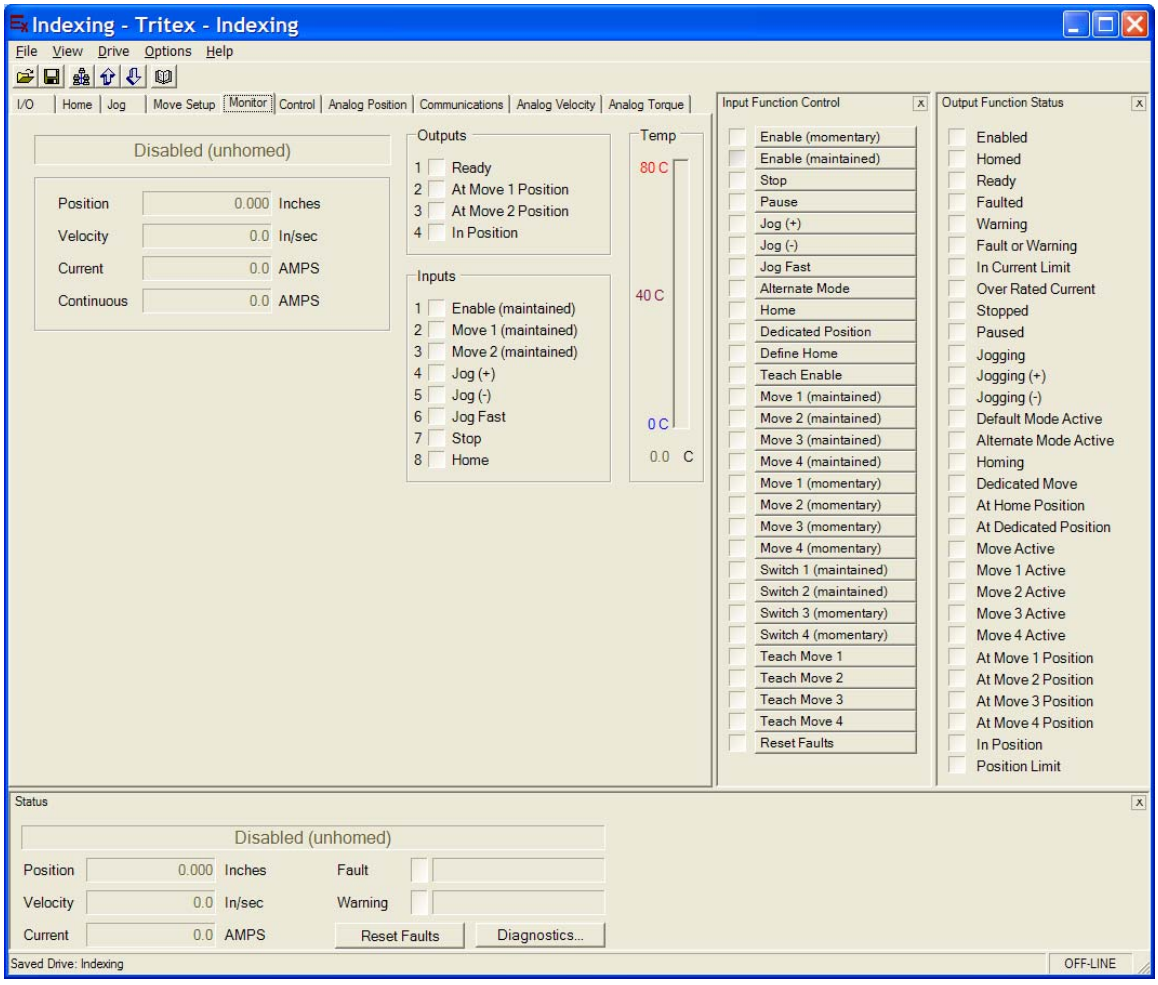
Input / Output Assignments

The I/O screen is used to assign the Input and Output functions to the hardware I/O lines, eight discrete inputs and 4 discrete outputs, see the installation section for hardware details. Clicking on the drop down box lists the available functions for each input. A download must be performed for the I/O assignments to take effect.

The Details button shows polarity switches. Each input or output line can be assigned a negative polarity (N). Clicking on the 'N' switches on negative polarity for the specific input line. An 'N' on an input means the selected function will be active when the input is off and not active when the input is on. An 'N' on an output line means the output will be on when the function is not active and off when the function is active.

Monitoring Input / Output Status

Input and Output Line status can be viewed on the Monitor tab. Output line can be set and overridden on the Diagnostics Tab.
The Input Function Control page allows the user to monitor and control all Input functions, these control buttons are logically ORed with the functions assigned to the input lines.
The Output Function Status indicates the status of all of the output functions. Both the Input Function Control and Output Function Status can be opened by going to the menu bar and clicking View / Page/ and select the page.



Input Function Definitions

Unassigned- No function is assigned to the I/O line

Enable Maintained- When this input function is “on” the drive will be enabled if, bus power is applied and there are no active faults. If there is a fault, toggling the Enable Maintained function will clear the fault if the fault condition no longer persists. If the logic power is cycled and the Enable Maintained is on the drive will automatically re-enable after the power up delay and no faults persist.

Enable Momentary- The drive will try to enable on the rising edge. If a fault prevents the enable from occurring, another rising edge is required. If the logic power is cycled, a rising edge of the Enable Momentary is required to re-enable.

Pause- All motion except a Jog will decelerate to a stop using the ramp of the active motion. When the Pause Function is removed the motion will continue using acceleration ramp of the active motion. Pause is does not pause Jog motion or motion from Host mode.

Stop- Activating the Stop Function will stop all motion using the Stop Deceleration Ramp. When the Stop Function is removed, motion may start again depending on Input Function status. For example if a Jog input function is active the Jog will continue when the Stop is removed. The Stop function is available in all modes of operation.

Jog + and Jog - - Activate the Jog motion, (see Jog Tab). Jog can be selected to have a higher priority and therefore override other motion types. (See the Startup tab of the System Setup Page). Only one Jog is allowed to be active at time. If both Jogs are selected a no Jog motion will occur.

Alternate Mode- There are three modes of motion operation, Default, Alternate and Host. Host Mode can only be entered via Modbus command while Default and Alternate mode can be selected via Input Functions or Modbus commands. If the Alternate Mode function is off then Default Mode is active. Default and Alternate can each be assigned to operate in one of the following: Digital Inputs, Analog Position, Analog Velocity or Analog Current. An application example could use Default Mode selected to Digital Input and Alternate Mode selected to Analog Position. With Alternate Mode Input function off the Inputs could be used to control homing, Jog and Moves as required when the Alternate Mode Input function is turn on the position will be controlled from the analog input.

Home- Initiates a Home cycle, see the Home page for Home parameters. The Home cycle will start on the edge of the Home Input Function. The function does not need to remain active to complete the Home.

Dedicated Move - Activates a Dedicated Move function, (see Dedicate Move for parameter & operation). This is a maintained type input function, if the input is turned off the dedicated move will stop, if other motion is commanded it will resume. Dedicated Move has the highest priority of all motion and will override all motion types except motion commanded from Host Mode. Dedicate move is only available after a Home has been completed.

Define Home- This input function loads the current position into the Home Position Parameter. This function is always available, therefore when activated, even during motion, a new Home Position will be defined. If a Maintained Move, Analog Position Mode or Host Position Mode is active the motor / actuator will move the commanded position relative to the new Home Position.

Teach Enable- When active enables the teach function

Move 1-4 (Maintained)- The Move Maintained Input functions are designed to be used with Absolute move types, they will start the specified move, if the function is deactivated during the move, motion will decelerate to a stop and resume when the function is re-activated. If the Move Maintained input function is used with Incremental Move Types a subsequent incremental moves will be started immediately after one is complete. For Incremental moves use the Move

1-4 (Momentary) Input Function. If more than one Move Maintained Input Function is active no motion will occur. Move Maintained Input Functions have priority over Move Momentary Input Functions.

Move 1-4 (Momentary)- The Move Momentary Input functions can be used with any move type. The rising edge of the input function will start the specified move; if the input function is left on a subsequent move will not start until another rising edge is detected. Turning the input function off during a move will have no affect on the motion.

Switch 1 & 2 Maintained – These input functions are designed to be use as a method of termination for the feed portion of a move. If the move feed termination is selected as Switch 1 or 2 Maintained the feed will stop when the input function is activated, if the Move Maintained Input function is still active and the Switch 1 or 2 input function is turned off the feed will resume until the Switch 1 or 2 input function is activated again.
Switch 1 & 2 can also be used as termination types for home moves; however the operation is the same as Switch 3 & 4 Momentary.

Switch 3 & 4 Momentary- These input function are designed to be used as a method of termination for a Home or the feed portion of a move. The feed portion of a move or a Home will terminate on the rising edge of these input functions.

Teach Move 1-4- These input functions are active only when the Teach Enable is active. Teach enable can be activated from its own input function or by Startup selection of Always Enable Teach (see system setup page). The rising edge of these input functions load the current position into the respective Move 1-4 positions.
These positions are automatically saved into non-volatile memory.

Reset Faults- The rising edge of this input function resets active faults if the fault condition has been removed. Note: Toggling the Enable Input function also clears faults.

Output Function Definitions

Enabled – Indicates the power stage of the drive is enabled. Requires that no faults are active, bus voltage is present and the enable is active.

Homed- Indicates that a Home cycle has been completed and absolute position is established. Homed goes inactive if Homing cycle is initiated. Homed will stay active unless a Position Tracking Fault occurs or logic power is removed.

Ready- Indicates the drive is Enabled and Homed.

Faulted- Indicates the drive is in a Fault condition. The active fault is displayed in the status window. The user has control over some fault conditions (see System Startup page).

Warning- Indicates a Warning condition. The active Warning is displayed in the status window. The user has control to select what conditions indicate a warning (see System Startup page).

Fault or Warning- This is the logically ORed condition of the Faulted and Warning output functions

In Current Limit- Active when any of the current limits are active. A current limit condition will come from the current that is active at the time. There is a Factory Current Limit (set at the factory) and a System Current Limit (set by the user on the System Setup page) the lower of the two will normally determine the current limit. During a Home the Home Current Limit is active. During the feed portion of a Move the Feed Current Limit is active. This is not a fault condition, only an indication that the drive is limiting the current to the motor / actuator. This condition will clear when the demand for the current is lowered.

Over Rated Current- Active when the continuous rated current (I^2t) has been exceeded. By default this causes a Fault Condition but may be selected to cause a warning or no fault condition. If the Fault condition is removed it is the responsibility of the user to prevent the drive from operating in this condition (see System Setup).

Stop- Indicates when the Stop is active.

Pause- Indicates when Pause is active

Jogging - Indicates when Jog + or Jog- is active

J*ogging* + -Indicates when Jog + is active

Default Mode Active- Indicates when the drive is in Default Mode. I the drive is enabled with Default, Alternate or Host Mode will be active.

Alternate Mode Active- Indicates when Alternate Mode is active.

Host Mode Active- Indicates when Host Mode is active.

Homing- Indicates when a homing cycle is active.

Dedicated Move- Indicates when the Dedicated Move is active.

At Home Position- Indicates when the actual position is at the Home Position within the window defined by the In Position Parameters (See In Position Window tab on the System Set-up Page)

At Dedicated Position- Indicates when the actual position is at the Dedicated Position within the window defined by the In Position Parameters (See In Position Window tab on the System Set-up Page)

Move Active- Indicates when any of the 4 Moves are active, will also remain active if the Move Maintained Input function is active even the specified Move is complete.

Move 1-4 Active - Indicates when the specific Move 1-4 is active.

At Move 1-4 Position- Indicates when the specific Move is within the window defined by the In Position Parameters (See In Position Window tab on the System Set-up Page). If the Move is feed type move the output function will remain active during the feed portion of the move.

In Position- Indicates when the actual position is at the Commanded Position within the window defined by the In Position Parameters (See In Position Window tab on the System Set-up Page)

Position Limit- Indicates the commanded position is outside of the position limit range. (See Position Limits tab on the System Set-up Page).

Analog I/O

Analog Input

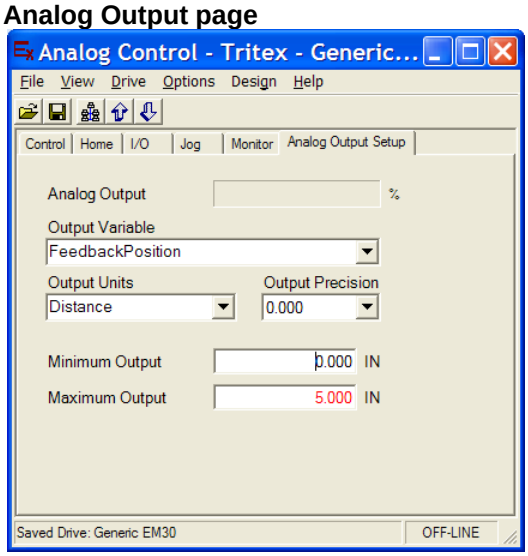
The Analog input Setup and Calibration is described in the Motion Control Section

Analog Output

Mapping & Scaling

The Tritex has one analog current output with a maximum range from 0 to ~22 mA (See Installation section for detailed specifications). The output can be mapped to internal parameters and scaled to produce the desired output over a specified range.

Analog Output page



Analog Output is the scaled value of the analog output; the value of this parameter is displayed while online. In the example above with Position feedback selected as the output parameter and Minimum Output position of 0.000 inches and a Maximum Output position of 5 inches, with the Feedback position at 0.000 inches the Analog Output will be 0%, when the Feedback Position is at 5.00 inches the Analog Output parameter will be 100%, if the actual position is 2.500 inches the Analog Output parameter will display 50%.

Output Variable, use the Output Variable drop down to select the drive variable to be mapped the analog output.

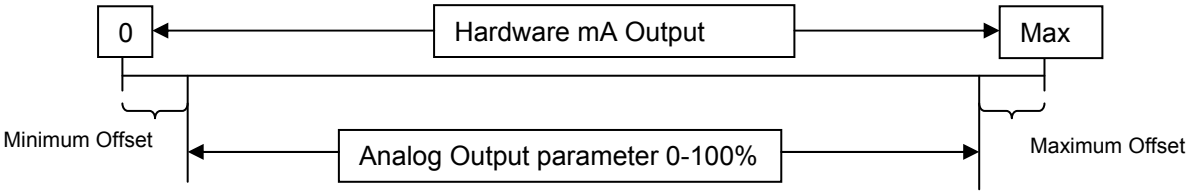
Output Units: The purpose of this parameter is to display proper units in the Minimum and Maximum Output variables; it does not affect the operation of the analog output. Select the Output units that correspond to the Output Variable selected. For example if Feedback Position is the Output Variable choose Distance as the Output Units, if Command Velocity is the Output Variable choose Velocity as the Output Units.

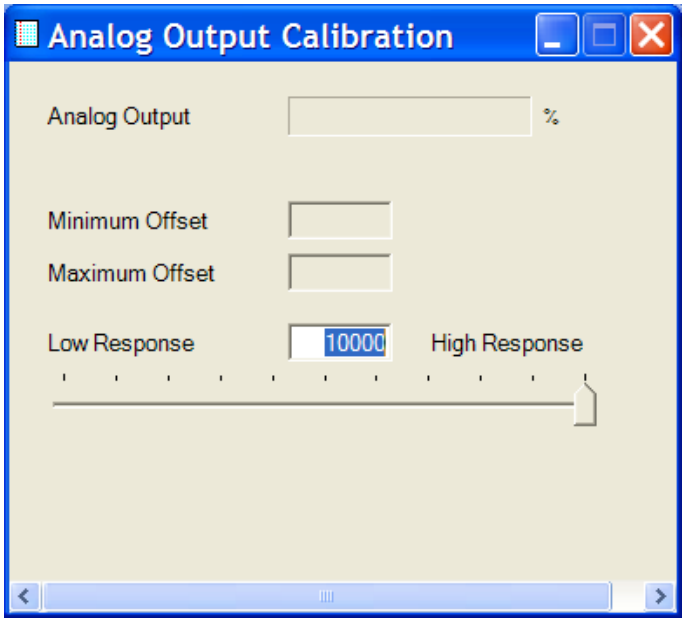
Output Precision: The purpose of this parameter is to display proper precision in the Minimum and Maximum Output variables; it does not affect the operation of the analog output. Choose the precision to match the Output Variable. For example if Command Position is chosen select 0.000 to match the precision of the distance units.

Minimum & Maximum Output set the internal scaling and offset to convert from the selected Output Variable to the Analog Output. Minimum Output corresponds to 0% and Maximum Output corresponds to 100% Analog Output.

Analog Output Calibration

When the Analog Output variable and ranges have been set the next step is to calibrate the analog output to the device that is measuring it, such as another controllers analog input or a meter.





Analog Output: The online value of the Analog Output without offsets. The parameter displayed on the Analog Output Setup page,

Minimum Offset: Sets the low end offset between the 0% Analog Output and the users desired minimum output. For example the user wants 0 ma out to 0% then the Minimum offset would be near 0, if the user wants 4mA out to be 0% then Minimum Offset Parameter would be adjusted higher until 4mA is output. This parameter allows only positive offsets.

Maximum Offset: Sets the high end offset between the 100% Analog Output and the users desired maximum output. With the Maximum output parameter at 0 the actual output is typically

about 22mA, only a positive number can be entered, increasing the offset will lower the actual analog output.

Response: The Response setting determines how quickly the actual analog output will react to changes in the mapped parameter.

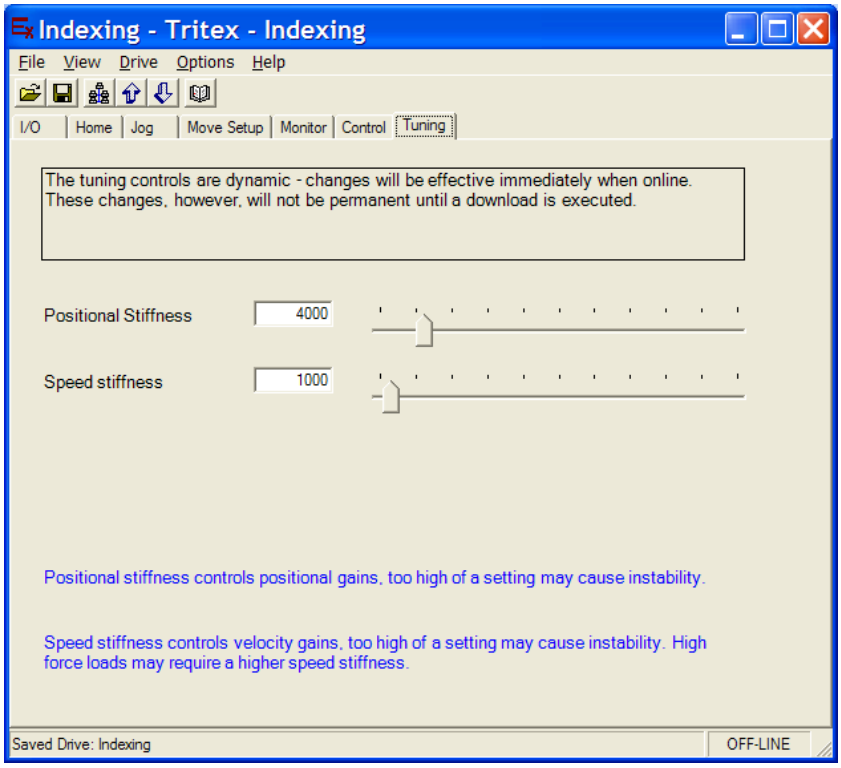
Online Diagnostics

Tuning

Tritex default gains are set to work out of the box for many applications, for those applications that require tuning two parameters are provided on the Tuning page.

Tuning Adjustments

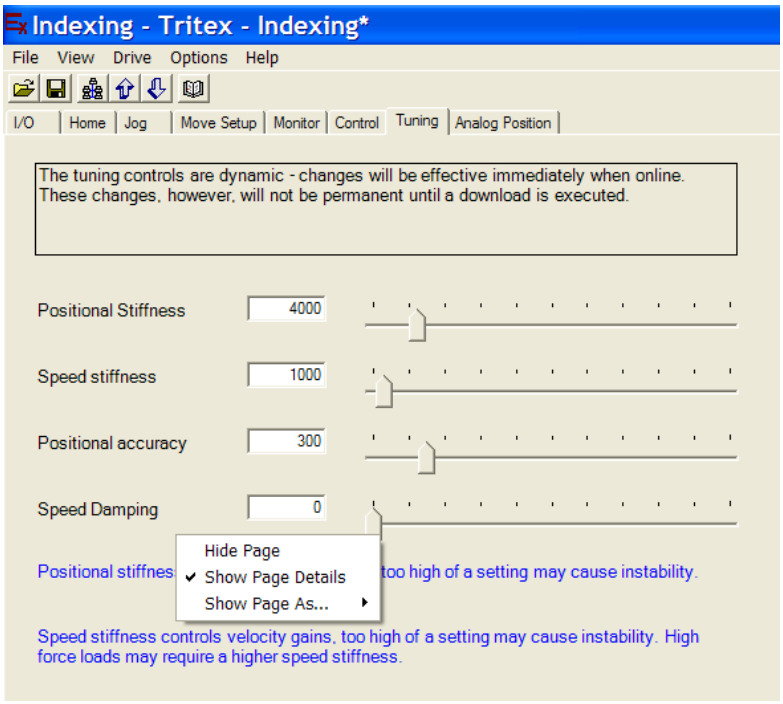
The drive's proprietary motion controls algorithms have been designed to reduce the number of tuning parameters for the customer. There are only 2 parameters; Position and Speed Stiffness. If the drive is online changes to the gain parameters take effect immediately, however they will not be save in non volatile memory until a down load is performed.


Indexing - Tritex - Indexing
File View Drive Options Help
I/O Home Jog Move Setup Monitor Control Tuning
The tuning controls are dynamic - changes will be effective immediately when online.
These changes, however, will not be permanent until a download is executed.
Positional Stiffness
4000
Speed stiffness
1000
Positional stiffness controls positional gains, too high of a setting may cause instability.
Speed stiffness controls velocity gains, too high of a setting may cause instability. High force loads may require a higher speed stiffness.
Saved Drive: Indexing
OFF-LINE

Positional Stiffness: Determines how tightly position is tracked, both during motion and at a stop. Too high of a setting can cause instability and overshooting of position. Too low of a setting will cause sluggish motion. For systems with backlash or compliance the Positional Stiffness will need to be lower.

Speed Stiffness: Determines how tightly the velocity profile is followed during a move. It has no affect at zero velocity. Too high of a setting can cause erratic motion at low speed. Systems with higher friction loads or high constant force loads usually require the speed stiffness to be turned up, so the move profile is more closely followed, if the speed falls behind during the move, the excess following error can cause overshoot at the end of the move.

Additional Tuning Parameters


Indexing - Tritex - Indexing*
File View Drive Options Help
I/O Home Jog Move Setup Monitor Control Tuning Analog Position
The tuning controls are dynamic - changes will be effective immediately when online.
These changes, however, will not be permanent until a download is executed.
Positional Stiffness
4000
Speed stiffness
1000
Positional accuracy
300
Speed Damping
0
Hide Page
Show Page Details
Show Page As...
too high of a setting may cause instability.
Speed stiffness controls velocity gains, too high of a setting may cause instability. High force loads may require a higher speed stiffness.

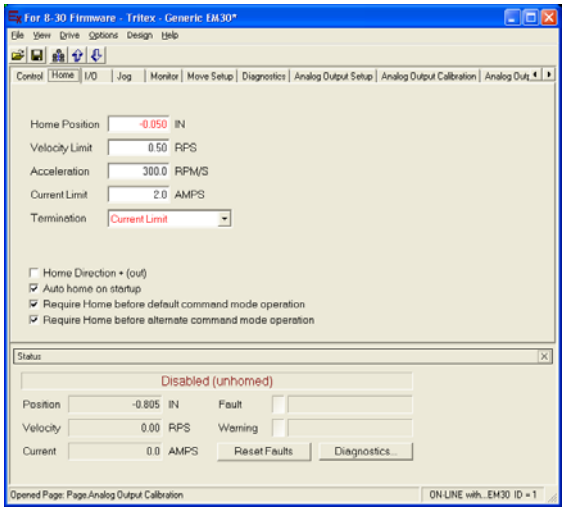
Additional tuning parameters can be accessed by right clicking on an empty area of the page and selecting Show Page Details
Two new Tuning parameters will now be displayed.
Positional accuracy- This parameter acts as integral gain providing additional in-position stiffness. The default value is 300, for some systems with a compliant load this parameter may have to be reduced.

Speed Damping- This parameter can be used to smooth out the velocity at higher speeds. For example, in some applications higher gains are needed at low speed or for additional in position stiffness, however in some cases these higher gains can cause instability at higher speeds, this parameter value can be turned up to dampen the gains while at the higher speed.

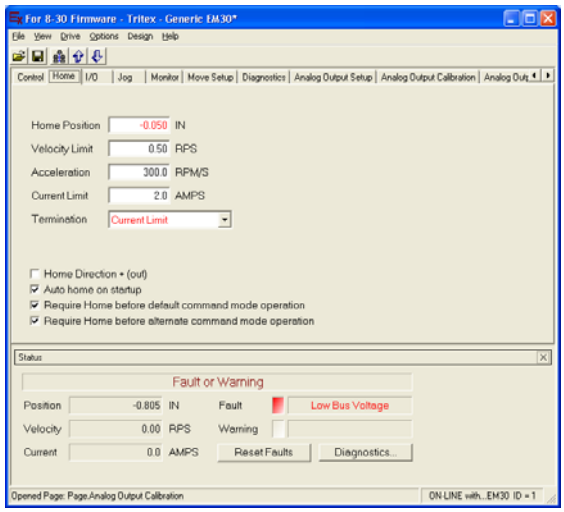
Status, Faults & Warnings

Status Display

Status, Faults and Warning can viewed while online, most easily with status page. This page is normally part of all applications and is docked at the bottom of the screen.
The action take by certain fault conditions is selectable by the user. See the System Setup section for details on user selection of faults and warnings.


For 8-30 Firmware - Tritex - Generic EM30*
File View Drive Options Design Help
Control Home I/O Jog Monitor Move Setup Diagnostics Analog Output Setup Analog Output Calibration
Home Position -0.050 IN
Velocity Limit 0.50 RPS
Acceleration 300.0 RPM/S
Current Limit 2.0 AMPS
Termination Current Limit
Home Direction + (out)
Auto home on startup
Require Home before default command mode operation
Require Home before alternate command mode operation
Status
Disabled (unhomed)
Position -0.805 IN
Velocity 0.00 RPS
Current 0.0 AMPS
Fault
Warning
Reset Faults
Diagnostics...
Opened Page: Page.Analog Output Calibration
ON-LINE with...EM30 ID = 1

Status: The Status page is shown above on the lower part of the screen, the first window displays the current status of the drive, Disabled and Unhomed in the example above. Other status displayed include, the active mode such as Default or Alternate, the active motion type such Homing, Jogging, Move1, Dedicated Move etc, other statuses displayed include Enabled, Disabled, Stopped, Paused and In Current Limit.


For 8-30 Firmware - Tritex - Generic EM30*
File View Drive Options Design Help
Control Home I/O Jog Monitor Move Setup Diagnostics Analog Output Setup Analog Output Calibration
Home Position -0.050 IN
Velocity Limit 0.50 RPS
Acceleration 300.0 RPM/S
Current Limit 2.0 AMPS
Termination Current Limit
Home Direction + (out)
Auto home on startup
Require Home before default command mode operation
Require Home before alternate command mode operation
Status
Fault or Warning
Position -0.805 IN
Velocity 0.00 RPS
Current 0.0 AMPS
Fault
Low Bus Voltage
Warning
Reset Faults
Diagnostics...
Opened Page: Page.Analog Output Calibration
ON-LINE with...EM30 ID = 1

Faults & Warnings are also displayed on the Status page, Low Bus Voltage for the example above. If the fault condition has been cleared the Reset Fault button can be activated to clear the fault. For some fault more information can be found on the Diagnostics page, activating the button provides a short cut to the Diagnostics page. In this example the actual Bus Voltage would be displayed, which may helpful in diagnosing the problem.

Faults, Possible Causes and Solutions

High Bus Voltage: A high bus voltage limit of 85 volts DC is set at the factory, any time the voltage goes above 85V the drive immediately faults. High Bus faults can occur from the bus power supply being too high or more likely from the bus power supply being charged up from the motor regeneration energy. Possible solutions are slower accelerations or other methods of storing or shunting the energy, see the Installation section. Bus Voltage can be monitored on the Diagnostics page.

Low Bus Voltage: A low bus limit of 19 Volts DC is set at the factory, any time the voltage goes below 19 volts the drive immediately faults. Bus Voltage can be monitored on the Diagnostics page.

Peak Current - A maximum current trip limit is set at the factory of 25 amps, this is in excess of the factory set current limit of 20 amps, this fault will only occur under short circuit conditions, a sudden crash into a hard stop from high speed or possibly in an unstable condition caused by improper tuning parameters. Current can be monitored on the Monitored on the Status page and the Monitor tab.

Continuous Current - The drive continuously monitors the drive power on an I^2t calculation and comparing actual value to the factory limit. Once this limit is hit the drive will take the action as setup in the System Setup page. Continuous Current can be monitored on the Monitored on the Monitor page.

Switch Not Found- This condition can occur in both Home and Feed Move motion types, if the Termination Type is set to Switch (1-4) and the Current Limit for the motion is hit before the Switch Input is sensed (Feed Move also requires the “Fault on Current Limit” box to be checked, see the Move page.)

Following Error- This condition occurs if the Positional Error and Time Limit are exceeded. Will typically occur if the actuator cannot provide enough force/torque to get to desired position either because the active current limit is set lower than needed or a hard stop or end travel has been reached.

Board Temperature- This condition occurs when the drive board temperature sensor is over 80 Deg C. This will occur if the actuator is continuously used above its power rating, remember de-rating factor is required for temperatures about 25 deg C.

Actuator Temperature- This condition occurs when the temperature sensor in the stator winding is open indicating the temperature over 150 Deg.

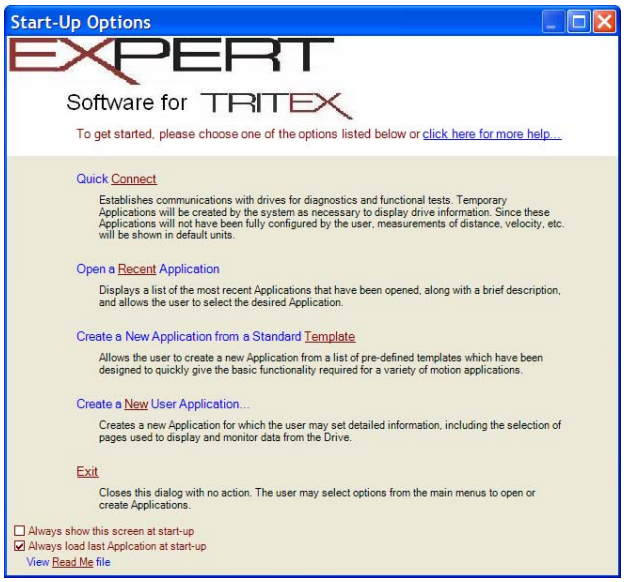
Tracking Error Fault- This is an internal fault that can only occur if the drive senses invalid position feedback signals. A calculated Tracking Error is displayed on the Diagnostics page, 0.5 is the fault level. This condition cannot be resolved in the field, the unit must be sent to the factory for repair.

Valve Configuration

Opening the Expert Software

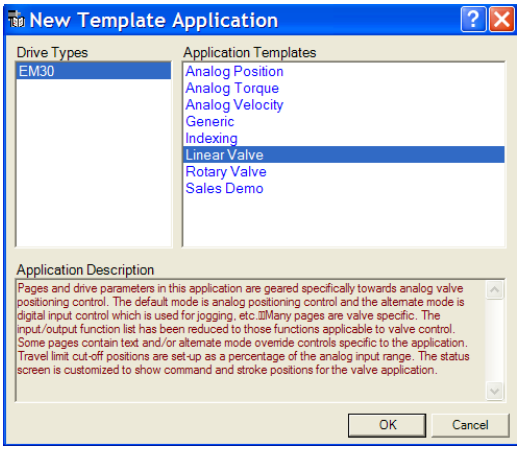
Welcome Screen

When the Expert software is opened the Welcome Screen will be displayed. This screen helps users who are unfamiliar with software get started quickly.

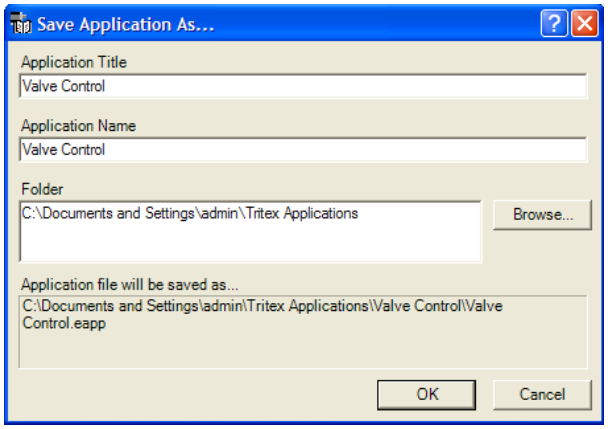

Start-Up Options
EXPERT
Software for TRITEX
To get started, please choose one of the options listed below or click here for more help...
Quick Connect
Establishes communications with drives for diagnostics and functional tests. Temporary Applications will be created by the system as necessary to display drive information. Since these Applications will not have been fully configured by the user, measurements of distance, velocity, etc. will be shown in default units.
Open a Recent Application
Displays a list of the most recent Applications that have been opened, along with a brief description, and allows the user to select the desired Application.
Create a New Application from a Standard Template
Allows the user to create a new Application from a list of pre-defined templates which have been designed to quickly give the basic functionality required for a variety of motion applications.
Create a New User Application...
Creates a new Application for which the user may set detailed information, including the selection of pages used to display and monitor data from the Drive.
Exit
Closes this dialog with no action. The user may select options from the main menus to open or create Applications.
Always show this screen at start-up
Always load last Application at start-up
View Read Me file

Create an Application from a Standard Template

Create a new Application from a Standard Template provides a list of canned applications. Select the Linear Valve or Rotary Valve application then click OK.


New Template Application
Drive Types
EM30
Application Templates
Analog Position
Analog Torque
Analog Velocity
Generic
Indexing
Linear Valve
Rotary Valve
Sales Demo
Application Description
Pages and drive parameters in this application are geared specifically towards analog valve positioning control. The default mode is analog positioning control and the alternate mode is digital input control which is used for jogging, etc. Many pages are valve specific. The input/output function list has been reduced to those functions applicable to valve control. Some pages contain text and/or alternate mode override controls specific to the application. Travel limit cut-off positions are set-up as a percentage of the analog input range. The status screen is customized to show command and stroke positions for the valve application.
OK
Cancel

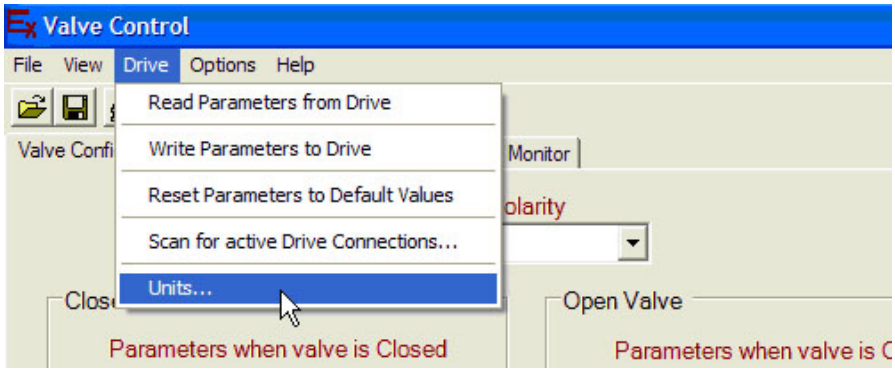
Once selected, a window will ask where you want to save your file. Select a location and title, and click OK



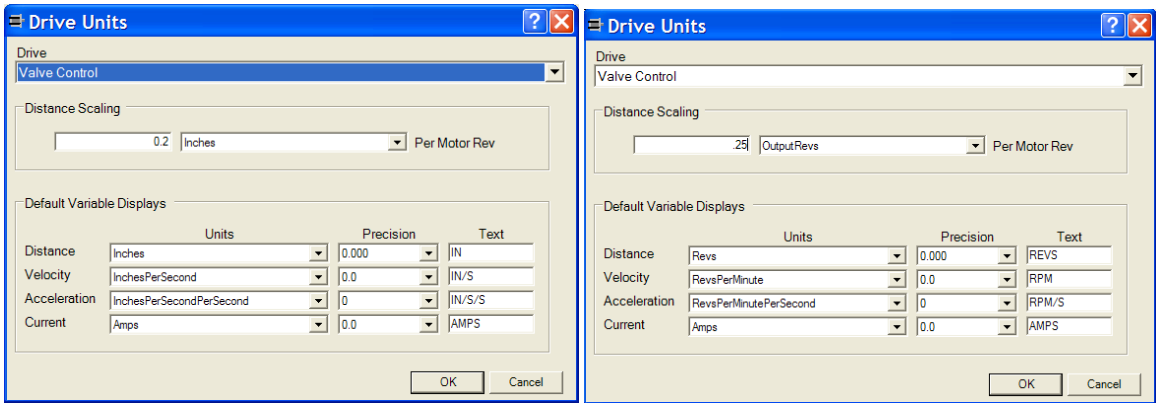
Basic Steps for Configuration

As parameters are changed the text will turn RED, this indicates the parameter has been changed but the drive file with change has not been saved, this indication is also shown when Online operation is active, so if a file is uploaded, any parameters that are different than the open file will show as red.

User Units



The first step in setting up a new application is to select the user units. On the main menu bar select Drive/Units and the following page will be displayed.

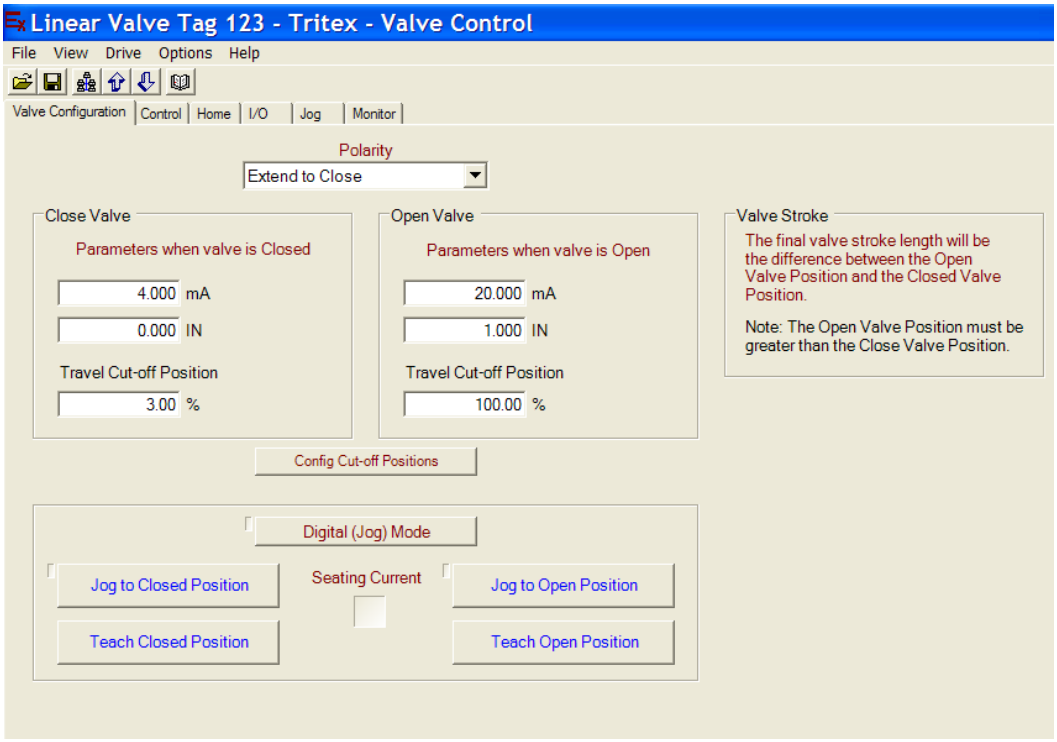


Distance Scaling:

The distance scaling factor can be setup for a linear actuator with an inch per motor rev conversion factor, rotary actuator with an output rev per motor rev conversion factor or for a custom actuator with a user units per motor rev conversion factor.
For linear actuators, this distance scaling factor is the actuators lead. (.1, .2, .4 or .5) For Rotary applications, this is the gear reduction. (0.25 for 4:1, 0.1 for 10:1, 0.04 for 25:1 etc)

Select the units for distance, velocity and acceleration units the application will work in. Select the precision to display as and enter the text that will actually be displayed on the pages. The inch to millimeter and inch meter conversions are done automatically based on the Inches per Motor Rev conversion. Output Revs and Degrees are calculated automatically based on the Output Revs conversion factor. For custom units User Units are calculated base on the User Unit per motor rev scale factor.

Valve Configuration


Linear Valve Tag 123 - Tritex - Valve Control
File View Drive Options Help
Valve Configuration Control Home I/O Jog Monitor
Polarity
Extend to Close
Close Valve
Parameters when valve is Closed
4.000 mA
0.000 IN
Travel Cut-off Position
3.00 %
Open Valve
Parameters when valve is Open
20.000 mA
1.000 IN
Travel Cut-off Position
100.00 %
Valve Stroke
The final valve stroke length will be the difference between the Open Valve Position and the Closed Valve Position.
Note: The Open Valve Position must be greater than the Close Valve Position.
Config Cut-off Positions
Digital (Jog) Mode
Jog to Closed Position
Seating Current
Jog to Open Position
Teach Closed Position
Teach Open Position

Polarity
Retract to Close/Extend to Close or Counter-clockwise to Close/Counter clockwise to Open - Changes the polarity of movement for all commands and feedback (position, velocity and current). This is used to change the actuator direction without changing the commanded positions, velocities or torques.
Note: Changing this flag changes the definition of all absolute position and therefore automatically clears the Homed output function. A Home is required to resume operation.

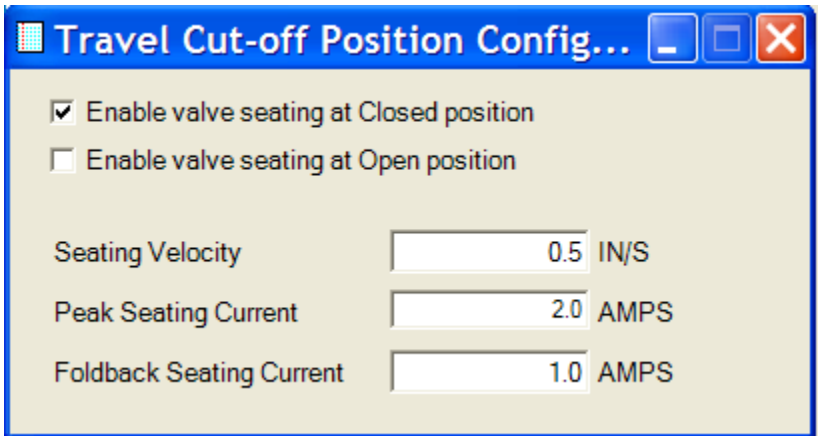
Close Valve/Open Valve Parameters

Milliamp signal
Enter the mA position you need for the closed and open positions. This can be either 4mA or 20 mA, depending on your control loop configuration.

NOTE: To change the command signal to voltage, go to the System Set-up section of this manual.

Valve Stroke
The valve stroke length is the difference between the open valve position and the closed valve position. The open valve position must be greater that the closed valve position. If you are unsure of the valve stroke, you can also set these parameters by using the jog mode (see Digital Jog Mode below).

Travel Cut-off Position.
The Tritex software has a valve seat algorithm that allows the actuator to switch from position mode to torque mode at a pre-determined position based on the milliamp signal. The control is switched to torque mode when the Position Command exceeds the set closed or open travel cutoff. This causes the actuator to apply a force without concern for actual position. The user can determine how fast, and how much force should be applied to properly seat the valve without damage.



Select what position you want to enable (Open, Closed or both) for the valve seat.

Seating Current Velocity
The maximum velocity during seating.

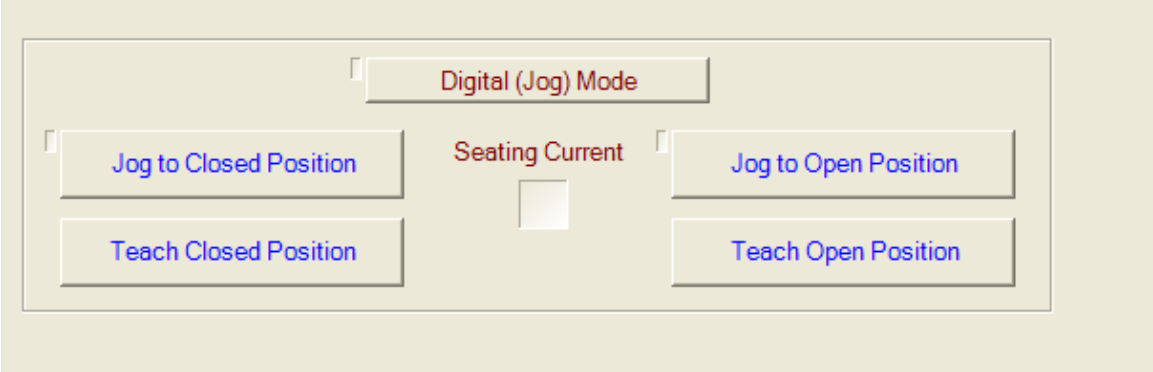
Peak Seating Current
The Peak Seating current determines the force that the actuator will use to seat a valve in position. Seating current should be set to provide the desired level of force to fully close (or open) the valve.

Foldback Seating Current
The Seating foldback current determines the force that the actuator will use to hold a valve in position once seated. When calculating the seating foldback current, use the following equation to calculate the force applied:

Seating force (Lbf) = seating foldback current (Amps) x Kt (lb-in/Amp) x 5.34 / Screw Lead

Warning: The cutoff parameters should be set within certain limits to avoid damage to the valve or actuator.

Digital Jog Mode



Selecting Digital Jog Mode allow the valve to be manually jogged to its closed and open positions. Click on the Digital Jog Mode button to enable this feature.

Note: The analog signal will be disabled while in digital mode

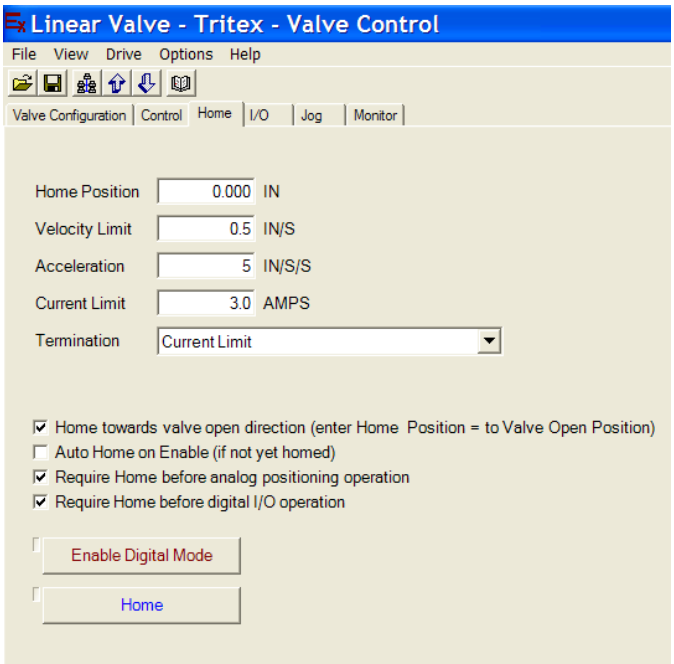
To close the valve, select the Jog to Closed Position button and hold it down with your mouse until the desired position is reached. You may then select Teach Closed Position to automatically fill in the closed valve position parameter. To open the valve, hold down the Jog to Open Position button until you have reach the desired position. Select the Teach Open Position to automatically fill in the open valve position parameter.

Note: Unselect Digital Jog Mode to re-enable the analog signal.

Home Operation

Home page

Before normal motion of the actuator can begin, the Tritex must know the actual absolute position of the actuator. For valve applications, home will be at one end of the stroke or the other.


Linear Valve - Tritex - Valve Control
File View Drive Options Help
Valve Configuration Control Home I/O Jog Monitor
Home Position 0.000 IN
Velocity Limit 0.5 IN/S
Acceleration 5 IN/S/S
Current Limit 3.0 AMPS
Termination Current Limit
Home towards valve open direction (enter Home Position = to Valve Open Position)
Auto Home on Enable (if not yet homed)
Require Home before analog positioning operation
Require Home before digital I/O operation
Enable Digital Mode
Home

Home parameters

Home Position: To home the actuator in the valve open position (common) enter the parameter entered on the Valve Configuration page under Open Valve.

Velocity Limit: The Home move maximum velocity.

Acceleration: The acceleration and deceleration ramps that will used during a home move

Current Limit: This sets the current limit for the Home move. If the Termination is set to Current Limit, the Home move will end

when the Actual Current is equal to or greater than this value. You should set the appropriate Current Limit above the current required to move the actuator at the home speed, but below the rated current of the actuator.

Termination: This action will end the Home move and define the actual home position as entered in the *Home Position* parameter.

Home towards valve open direction: Select this box to home to the open valve position. The Home Position should be equal to the Open Valve position found on the Valve Configuration page.

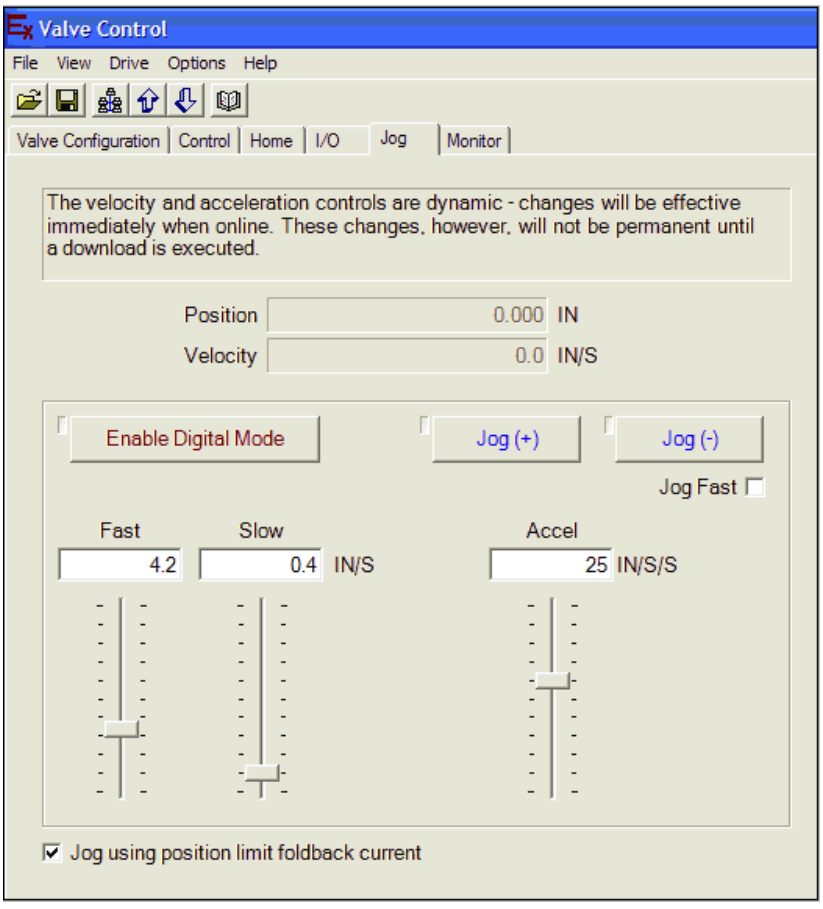
Auto Home on Enable: Select if a Home operation if automatically performed on power-up.

Require Home before analog positioning operation: If checked requires a Home to be completed before operation from the analog signal
.
Require Home before digital I/O operation: If checked requires a Home to be completed before operation from the digital I/O operation.

Jog Operation

Jog Page

Jog Parameters


Valve Control
File View Drive Options Help
Valve Configuration Control Home I/O Jog Monitor
The velocity and acceleration controls are dynamic - changes will be effective immediately when online. These changes, however, will not be permanent until a download is executed.
Position 0.000 IN
Velocity 0.0 IN/S
Enable Digital Mode
Jog (+)
Jog (-)
Jog Fast
Fast
Slow
Accel
4.2
0.4 IN/S
25 IN/S/S
Jog using position limit foldback current

Jog Slow: The Jog speed when the Fast Jog is not selected
Jog Fast: The Jog speed when the Fast Jog is selected
Jog Acceleration: The Acceleration and Deceleration ramp used in Jog Mode

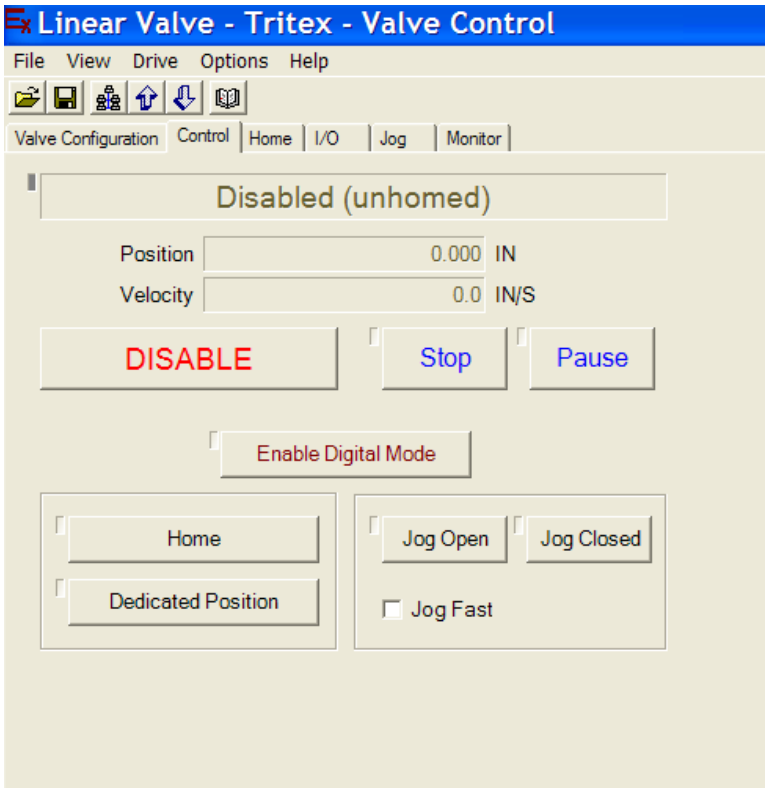
Jog Controls

Jog Fast, Slow and Acceleration slider bars provide easy change of jog parameters that take effect immediately but are not save permanently unless a download is performed. The Jog (+) an d Jog (-) buttons will activate a Jog as long as they held down with a mouse click. The indicators next to buttons illuminate when the Jog is active.
Jog Fast Check Box or Input Functions selects the Jog Fast velocity.

Jog using position limit foldback current- This flag limit the available current when a Jog motion is active the Foldback Current on the Position Limit tab of the System Setup page. Can be used to find hard-stop positions or limit available torque/force during manual operation.

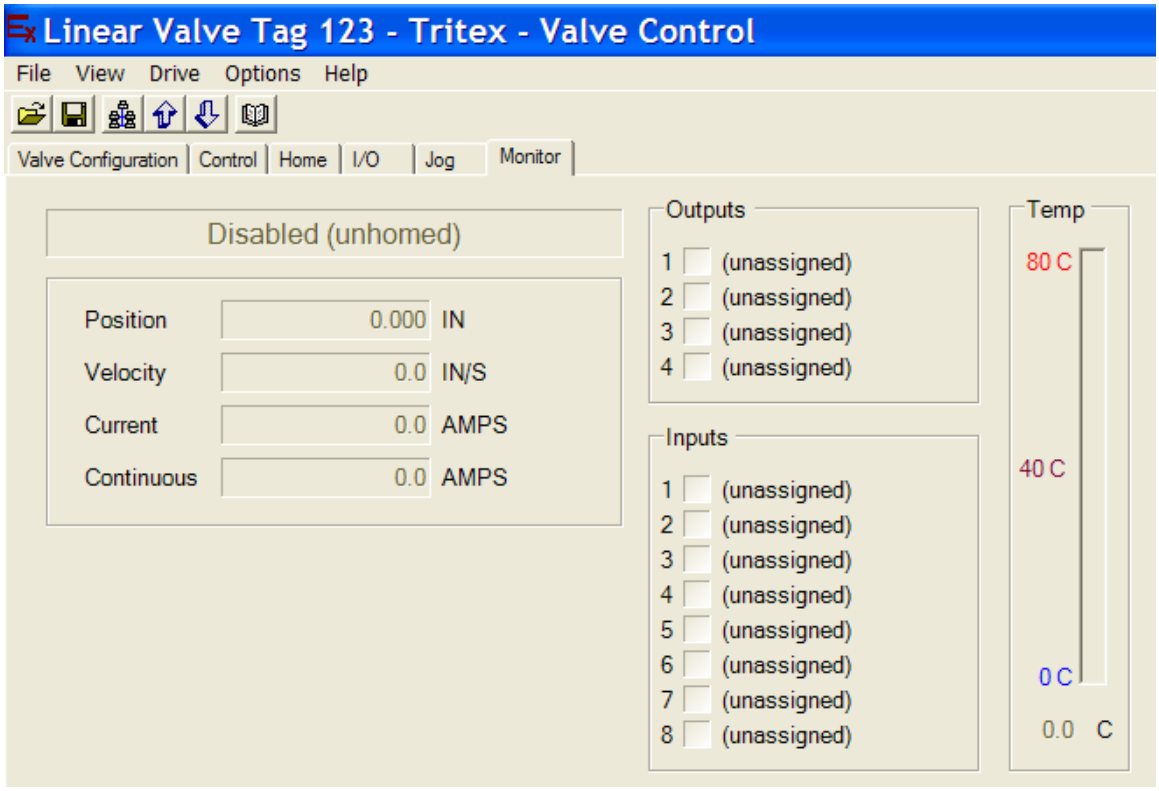
The Jog function can be initiated from the Jog +/- Input functions activated from either the assigned digital inputs, Input Function Control Page, Jog buttons on the Jog Page or the Control Page, or from the Modus addresses. Jog can be selected to override other motion types see the System Setup page description and Motion Description.

Control Page



The Control page can be used for starting and stopping motion directly from the screen.

Monitor Page



The monitor page allows the user to view the current status of the actuator, as well as monitor any digital Inputs and out puts, should they be assigned (see Inputs and Outputs).

Maintenance and Troubleshooting

Maintenance Procedures

Disassembly

If your actuator has a preloaded roller screw, do not remove it from the cylinder. Preloaded screws require special tooling and procedures for proper disassembly and reassembly. Contact Exlar Corporation to arrange for maintenance of a preloaded screw actuator.

Refer to the exploded view on the following page.

1.) Remove the actuator assembly from the machine by disconnecting the cables, main rod coupling and actuator mounting bolts or fasteners.

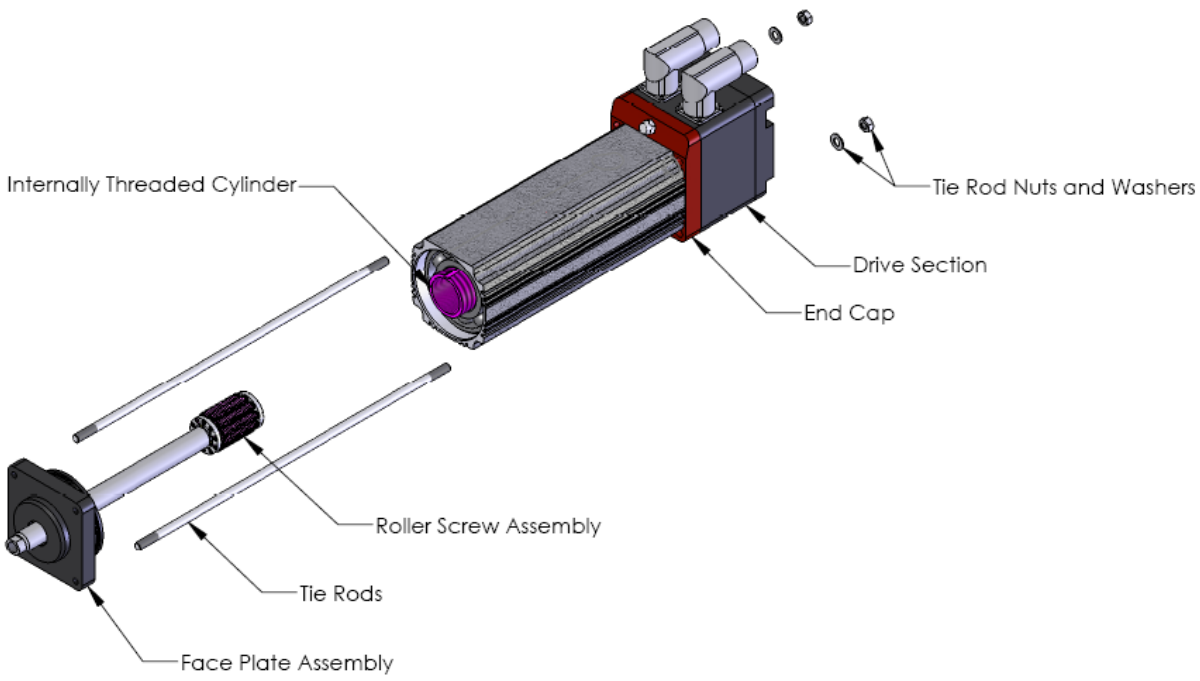
2.) If your unit does not have an external anti rotate assembly, skip this step. Loosen the two machine screws that clamp the anti-rotate cross member to the actuator output rod. Slide the anti-rotate mechanism forward and off the actuator.

3.) Remove the rear tie rod nuts from the back of the actuator.

The end cap houses the Tritex drive and control. Extreme care should be taken when removing the tie rod nuts or tie rods so as not to twist or pull on the drive section of the actuator. Do <u>not</u> disconnect the wiring between the drive and the actuator.

4.) If your actuator does not have a front flange, skip this step. Slide the front flange forward and off the actuator. The tie rods will remain attached to the front flange.

5.) When the face plate is removed, the thrust bearing and the open end of the roller screw internally threaded cylinder (ITC) are visible. The roller screw can be removed by turning it counter clockwise and threading it out of the cylinder. It may be necessary to keep the roller screw cylinder from turning to remove the screw.



Lubrication Maintenance

Grease lubricated units will require periodic inspection and renewal of the bearing and roller screw grease. The table below shows the recommended grease renewal period.

RMS rotational speed (RPM)	Recommended Grease Renewal Period (hours)	
	CASE TEMP 65°C (149°F)	CASE TEMP 80°C (176°F)
250	10,000	5,000
500	8,500	4,250
1000	6,000	3,000
1500+	3,500	1,750

Grease Renewal

The angular contact thrust bearings located in the front of the actuator, the roller screw cylinder, and the roller screw assembly are the components that require grease. They require a coating of grease. They do not need to be packed with grease. Excess grease requires more torque from the motor when returned to operation, and does not improve the lubrication of the unit.

1.) Use a brush to work approximately 0.5 in^3 of grease for every 3 inches of stroke length into the roller screw cylinder. Be sure to cover all of the threaded areas of the cylinder.

2.) Use a brush to work grease in to the roller screw assembly. Be sure to cover all the threaded surfaces of the screw assembly. This can be accomplished by applying grease to a few places on the roller screw assembly and rotating the components repeatedly in both directions to work the grease into the assembly.

3.) Force grease into the front of the thrust bearing assembly. Make a concerted effort to insure that the grease is well worked in. Grease must reach the bearing just behind the bearing that is visible as well. Use the following amounts of grease for each size roller screw and bearing:

TLM20: 0.5 in^3
TLM30: 0.75 in^3

Reassembly

1.) Rethread the roller screw into the internally threaded cylinder (ITC). It is a multiple start screw, and this is not always easy. DO NOT FORCE THE ROLLER SCREW INTO THE CYLINDER. It is best to have the actuator vertical with the open end of the roller screw cylinder facing up. Position the roller screw above the cylinder so that it is aligned axially with the ITC. Slowly turn the roller screw 1/4 to 1/2 a turn counterclockwise with it in contact with the ITC. This will help to align the threads on the roller screw with the threads in the ITC. Rotate the roller screw clockwise and it should begin to thread into the cylinder. If it does not turn freely, remove it and begin again. When threading the screw into the cylinder, it will roll freely into the actuator. When it reaches the portion of the cylinder that contains the motor magnets, the roller screw will be more difficult to turn because of the magnetic field of the magnets. THIS IS NORMAL. Continue to thread the roller screw into the cylinder. When it reaches the bottom, it will become difficult to turn and the motor and bearings will begin to rotate with it. The roller screw is now fully inserted into the cylinder.

2.) Place a small amount of seal lubricant on the inside surface of the seal/bushing assembly.

3.) Carefully slide the face plate and bushing/seal assembly over the actuator rod end, while guiding the tie rods through the holes in the rear end cap of the actuator. The seal is a tight fit on the rod end. Take care not to damage the seal on the threads of the extending rod. Standard TLM Series rods have a chamfer to provide a lead in for replacement of the seal and bushing. Be sure that the faceplate seats completely and squarely on the front of the actuator. The inner surface of the faceplate provides the pre-loading for the bearings, and it is important that it is properly seated.

Units With a Front Flange

Replace the faceplate as described above. Remount front flange by sliding tie rods through the holes in the faceplate and through the holes in the rear end cap. Pilot the flange on the pilot diameter located on the front of the faceplate.

4.) Replace the rear tie rod washers and nuts and tighten to the proper torque. Tighten the nuts simultaneously by partially tightening each in an opposing corner pattern until each is torqued to the rated value as follows.
TLM20: 20 lbf-in (1.7 lbf-ft, 2.26 N-m)
TLM30: 90 lbf-in (7.5 lbf-ft, 10.16 N-m)

5.) If your actuator has an external anti-rotate mechanism, slide the rod or rods of the anti-rotate mechanism through the front flange and into the guide bushing or bushings mounted to the rear of the flange. Position the extending rod so that the wrench flats are parallel to the long side of the flange. Slide the cross member assembly of the anti-rotate mechanism over the end of the rod and onto the wrench flats. Tighten the two screws that clamp the assembly to the actuator rod.

Troubleshooting Procedures

This section provides you with guidelines and hints on troubleshooting various problems that may be encountered during installation and operation of your Tritex Series actuator.

Symptom / Trouble	Possible Cause / Troubleshooting Procedure
No response from actuator.	1. Check drive for faults that may indicate problem via I/O or Expert software. 2. Check to insure that drive is powered and enabled. 3. Check for proper wiring.
Actuator seems to be enabled (receiving current) but is not operating or is operating erratically.	1. Drive may be improperly tuned. Check all gain settings. 2. Check for load irregularities or excess compliance.
Actuator cannot move load.	1. Load is too large for the capacity of the actuator or too much friction is present. 2. Excessive side load. 3. Misalignment of output rod to load. 4. Current limit in drive is set too low 5. Power supply has too low of current capacity
Actuator housing moves or vibrates when shaft is in motion.	1. Check actuator mounting. Insure that the actuator is securely mounted. 2. Drive is improperly tuned (wrong gain settings). Tune amplifier.
Output rod rotates during motion and thus does not provide proper linear motion.	1. Install Exlar anti-rotation assembly or incorporate anti-rotation into the application.
Actuator is overheating.	1. Insufficient cooling for application requirements. Contact Exlar engineering. 2. Ambient temperature is too high. 3. Actuator is being operated outside of continuous ratings. 4. Amplifier is poorly tuned causing excessive unnecessary current to be applied to motor. Check Gain settings.

Returning a Product for Repair

STANDARD REPAIR LEADTIME:

- Two weeks for written evaluation from Exlar
- Two weeks from receipt of approval (by fax or email) for repair where parts are available.
- An evaluation charge per unit after evaluation applies if customer chooses not to repair; or if product is found not in need of repair.

EXPEDITED REPAIR LEADTIME:

- An expedite charge per unit can be quoted.
- This provides one week for written evaluation from Exlar
- This provides one week from receipt of approval (by fax or email) for repair where parts are available.

PROCEDURE:

- Please discuss the return with Exlar Technical Support prior to requesting an RGA number to see if it is possible to resolve the issue prior to return.

- If it is determined that an RGA number is required, please do so by contacting the Returned Goods Administrator. Phone 952-500-6200 or email returns@exlar.com.
    - International Repairs: Closely follow instructions provided by the Exlar Returned Goods Administrator. Failure to comply with issued instructions may result in delays for repair and return.

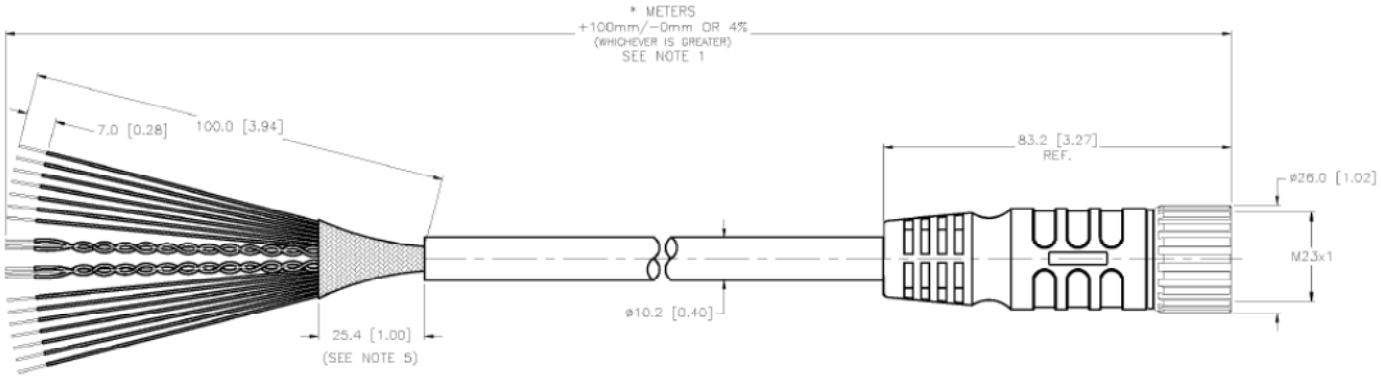
- Exlar requires a purchase order at the time of RGA; $0 on warranty returns, or for the standard evaluation charge per unit on all non-warranty units for the evaluation fee.

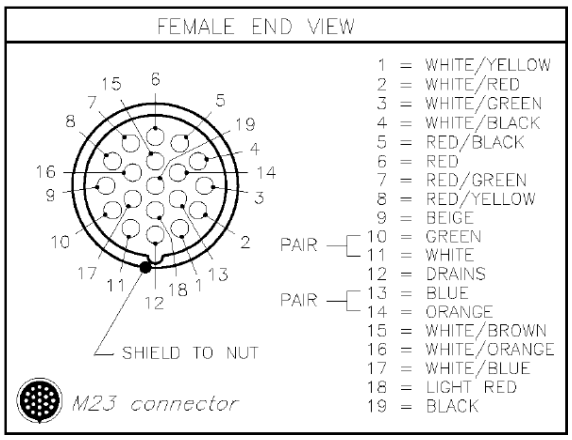
- Following the evaluation, you will receive a quote from Exlar on the charges that will apply. If the actuator repair is approved, the evaluation fee will be waived and we will request an amended PO for the actual repair value.

Accessories

Cables

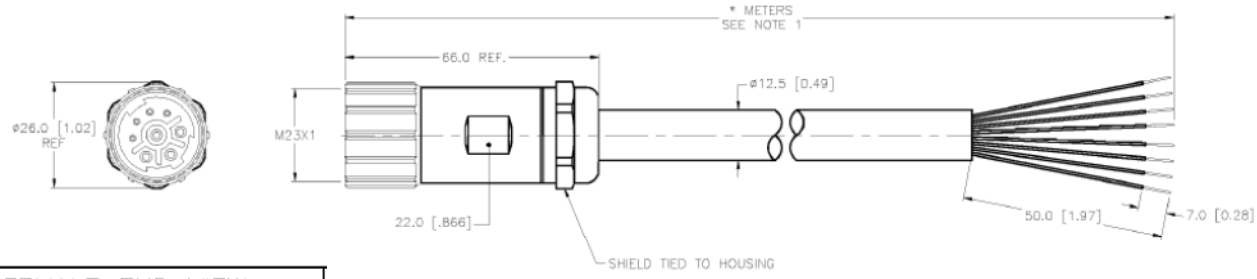
TTIOC-xxx I/O Cable

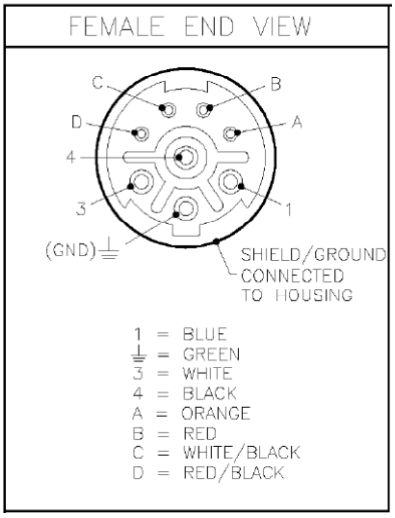




SPECIFICATIONS	
CONTACT CARRIER MATERIAL/COLOR	NYLON or PBT/GRAY
MOLDED HEAD MATERIAL/COLOR	THERMOPLASTIC PUR/BLACK
CONTACT MATERIAL/PLATING	BRASS/GOLD
COUPLING NUT MATERIAL/PLATING	BRASS/NICKEL
RATED CURRENT [A]	3.0 A
RATED VOLTAGE [V]	150 V
OUTER JACKET MATERIAL/COLOR	PVC/BLACK
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	18x22 AWG/2x22 AWG DRAIN
SHIELD/BRAID	ALUMINUM FOIL SHIELD/T−C BRAID
TEMPERATURE RANGE	−40°C to +105°C (−40°F to +221°F)
PROTECTION CLASS	IEC IP67

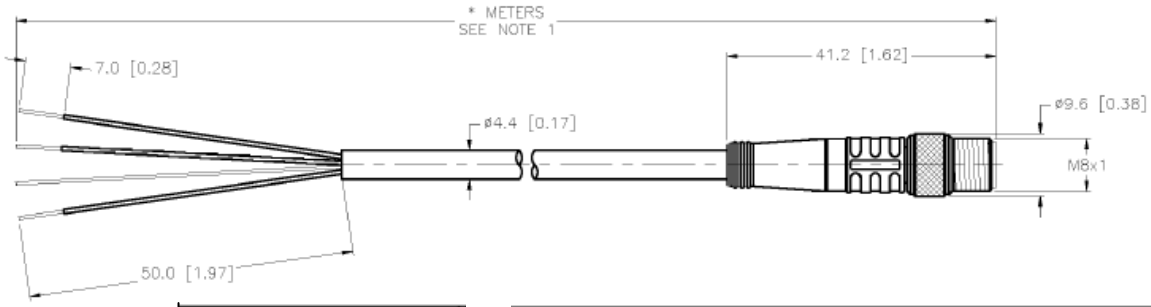
TTIPC-xxx Power Cable

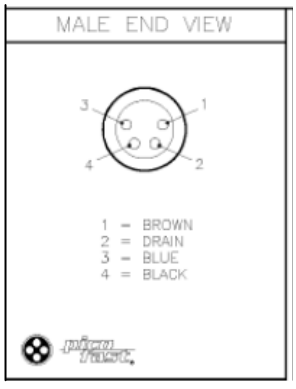




SPECIFICATIONS	
CONTACT CARRIER MATERIAL	NYLON
CONTACT MATERIAL/PLATING	BRASS/GOLD
HOUSING MATERIAL/PLATING	BRASS/NICKEL
RATED CURRENT [A]	24 A (1–4), 8 A (A–D)
RATED VOLTAGE [V]	600 V
CONDUCTOR INSULATION MATERIAL	PVC
OUTER JACKET MATERIAL/COLOR	PVC/YELLOW
NUMBER OF CONDUCTORS [AWG]	4x12 AWG, 4x18 AWG
DRAIN/SHIELD	18 AWG/FOIL AND TINNED-COPPER BRAID
TEMPERATURE RANGE	−40°C to +105°C (−40°F to +221°F)
PROTECTION CLASS	IEC IP67

TTICO-xxx Communications Cable





SPECIFICATIONS	
CONTACT CARRIER MATERIAL/COLOR	NYLON OR PUR/BLACK
MOLDED HEAD MATERIAL/COLOR	THERMOPLASTIC PUR/YELLOW
CONTACT MATERIAL/PLATING	BRASS/GOLD
COUPLING NUT MATERIAL/PLATING	BRASS/NICKEL
RATED CURRENT [A]	2.0 A
RATED VOLTAGE [V]	125 VAC/VDC
OUTER JACKET MATERIAL/COLOR	PUR/BLACK
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	3x24 AWG
DRAIN/SHIELD	26 AWG DRAIN/FOIL
TEMPERATURE RANGE	−40°C to +105°C (−40°F to +221°F)
PROTECTION CLASS	MEETS NEMA 1,3,4,6P AND IEC IP67

Power Supply

TTPS1048 Power Supply Introduction

The TTPS1048 is an unregulated power supply with standard DC outputs 48 VDC, 10 Amps. 108/120/132/216/240/264 VAC input.

Standard Features

- Bobbin Wound Transformer
- Computer Grade Capacitors
- Floating Output
- Full Rated to 55 degrees Celsius
- Open Frame Construction
- Secondary Fuse Protection
- 50 amp, 200 volt full bridge rectifier

Specifications

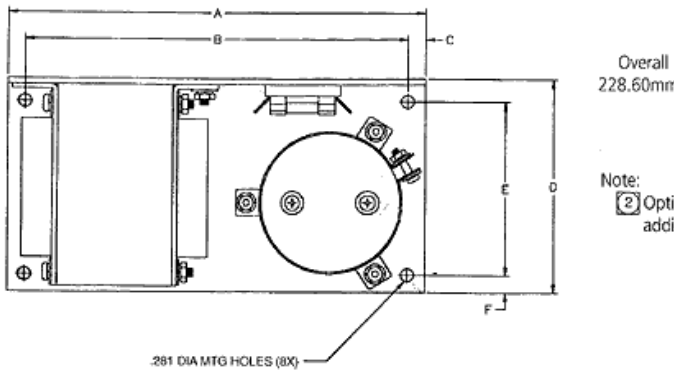
AC Input 47-63 Hz
108/120/132/216/240/264 VAC Selection
Output Ripple: 3% RMS at full rated load, 4% on 12 volt model IP500U12
Efficiency @ Full Load 80% typical
UL Recognized for USA and Canada File Number E133338
TUV Rheinland licensed. Certificate no. R 9675002
Complies with the requirements of standard EN 60590 and low voltage directive 72/23/EEC

Typical DC Output at Nominal Input

No Load Voltage: 56.6
Half Load Voltage: 52.8
Full Load Voltage: 48.8
Full Load Amps: 10

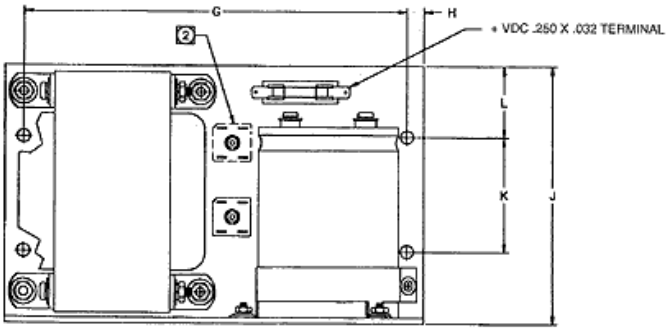
Typical DC Output @ Nominal Input				
Model	**No Load Voltage**	**Half Load Voltage**	**Full Load Voltage**	**Full Load Amps**
TTPS1048	56.6	52.8	48.8	10

TTPS1048 Dimensions



Overall Size: 9.00" x 5.62" x 4.62"
228.60mm x 142.75mm x 117.35mm
Weight 18 lbs.

Note:
[2] Optional location for additional Rectifier



	INCH	mm
A	9.00	228.6
B	8.25	209.55
C	.37	9.40
D	4.62	117.35
E	3.750	95.25
F	.38	9.65
G	8.240	209.30
H	.35	8.89
J	5.62	142.75
K	2.500	63.50
L	1.56	39.62

Communication Converters

Model TT232485 RS232 to 485 Introduction

Model TT232485 is a feature-packed RS-422/485 9-pin converter. It converts unbalanced, full or half-duplex RS-232 signals to balanced, full or half-duplex RS-422 or RS-485 signals at baud rates up to 115.2 kbps. In addition the unit optically isolates and surge suppresses the RS-422/485 lines. The driver uses automatic SD (send data) or RTS (handshake) control, or can be configured as always enabled for use in RS-422 systems.

A dipswitch selects communication features on the TT232485. Two LEDs show data traffic in either direction. Only one power supply is necessary, located on the RS-232 side. The isolated power and ground on the RS-422/485 side are generated internally.

Connections are made through a DB9 female connector on the RS-232 side and terminal blocks on the RS-422/485 side. All terminal blocks, dip switches, and jumpers are located inside the hood and are reachable through the access panel, which slides closed to protect the connections.

Description

The RS-232 port has a DB9 female connector with pins 3 (TD), 2 (RD), and 5 (Signal Ground) supported, pins 7 (RTS) and 8 (CTS) are tied together, and pins 6 (DSR), 1 (CD), and 4 (DTR), are also tied together. The 485OT9L has two LEDs: a Transmit Data LED showing when data goes from the RS-232 side to the RS-485 side, and a Receive Data LED showing data going from the RS-485 side to the RS-232 side. These are very useful for determining if data is getting through the converter. The RS-485 terminal blocks support Transmit Data (A) and (B), Receive Data (A) and (B), and Signal Ground. A single supply voltage of 10 to 30 VDC on the RS-232 side powers the unit. An 8-position dipswitch allows the selection of baud rate, 2-wire or 4-wire mode, echo on or off, and termination in or out.

RS-422/485 Driver Control

The TT232485 uses either RTS Control or Send Data Control to enable the RS-485 driver. This option is user selectable by setting push-on jumpers located next to the terminal blocks. RTS controls the driver using toggling Request to Send (pin 7) of the RS-232 side. Raising RTS enables the driver and lowering RTS disables it. Automatic Send Data Control recognizes the first bit of data from the RS-232 side, enables the transmitter and disables the receiver. After the last bit of data is sent from the RS-232 side, the TT232485 waits one character length then disables the transmitter and enables the receiver. The timeout can be selected with dipswitches or by changing the value of R21 (see Table, Baud Rate Selection). The timeout is preset at the factory for 9600 baud. Removing both sets of jumpers completely will constantly enable the RS-485 driver. This makes the TT232485 behave like an RS-422 converter. For settings, see Table, Standard Communications Settings.

Termination and Echo Options

Termination resistance can be selected with Switch 8 for high baud rates and long cable distances. The 4-wire/2-wire switches (6 and 7) are turned off for 4-wire mode and on for 2-wire mode. When they are set on, they connect TD(A) to RD(A) and TD(B) to RD(B) internally. Switch 5 controls Echo on and off. When switch 5 is in the off position the receiver is constantly enabled. Placing the switch in the on position allows the driver or the receiver to be enabled at any time. In 2-wire mode it is recommended that switch 5 be turned on to prevent data being set out from "echoing" back through the receiver. Up to 32 receivers can be driven by any one RS-485 driver, allowing you to put together large systems with many drop points.

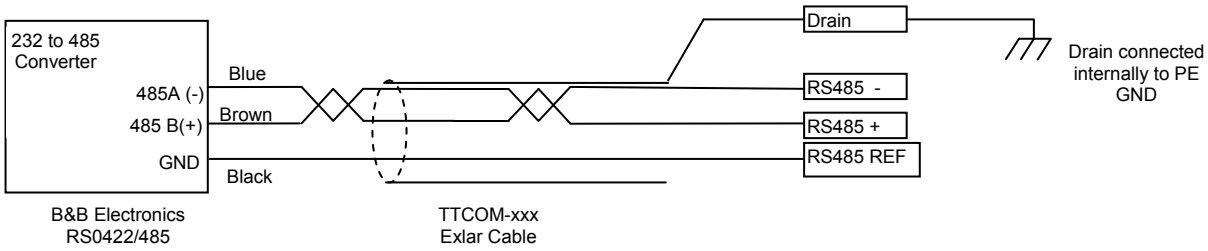
Two wire set-up for Tritex

Baud Rate Selection						
Baud	**Switch 1**	**Switch 2**	**Switch 3**	**Switch 4**	**R21**	**Time out (ms)**
1200	OFF	OFF	OFF	OFF	820kς	9.0
2400	OFF	OFF	OFF	OFF	410Kς	4.5
4800	ON	OFF	OFF	OFF	Not Used	2.2
9600	OFF	ON	OFF	OFF	Not Used	1.1
19200	OFF	OFF	ON	OFF	Not Used	0.6
38400	OFF	OFF	OFF	ON	Not Used	0.3

Tritex default baud rate is 19200.

Standard Communication Settings for Tritex				
Communication Mode	**JP1**	**Switch 5 Echo**	**Switch 6 4W/2W**	**Switch 7 4W/2W**
RS-485 2-Wire Mode (half-duplex)	RTS or SD	ON	ON	ON

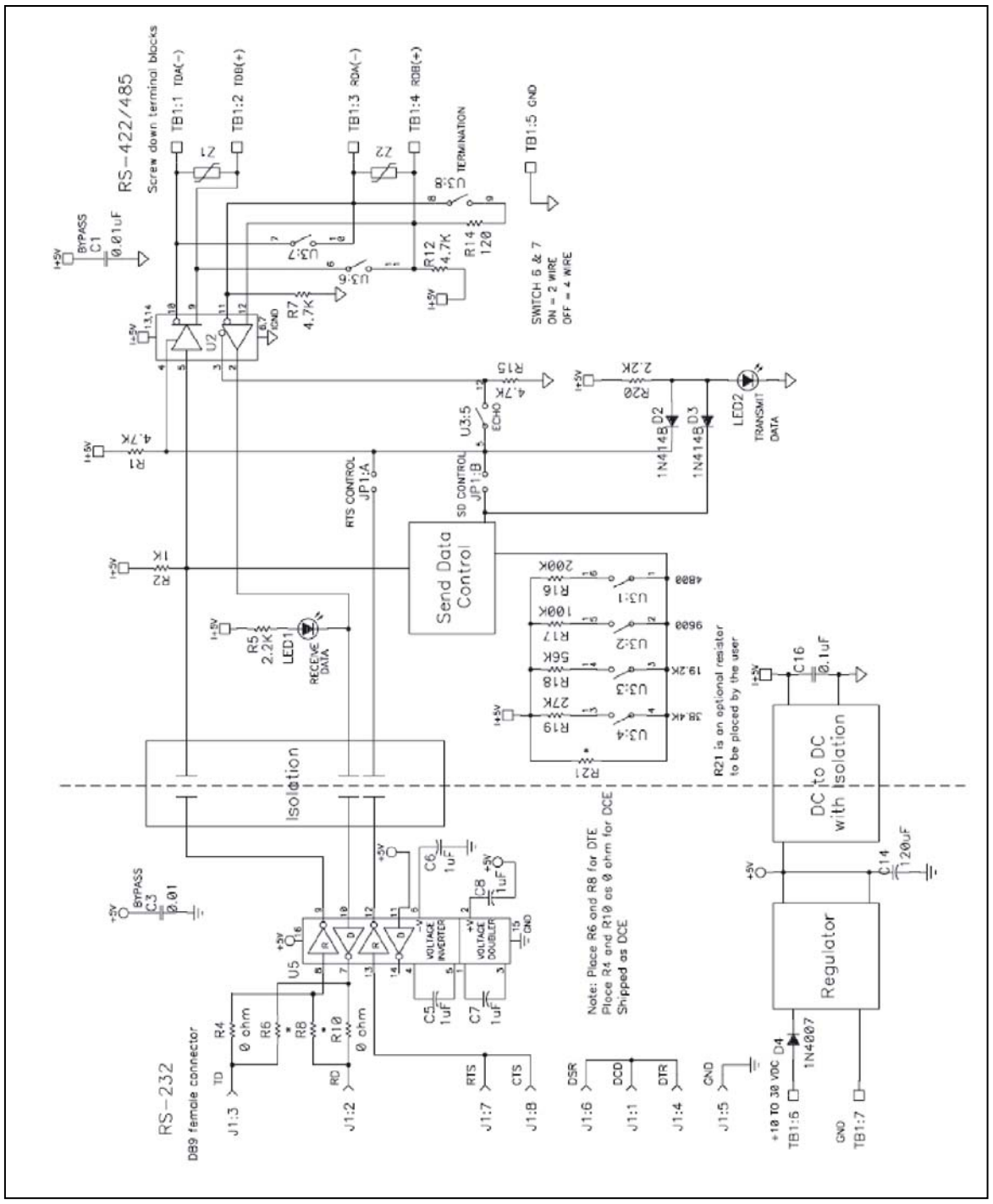
Typical Wiring Setup



Specifications

Dimensions: 2.7 x 5.1 x 0.9 in (7.0 x 13.0 x 24.0 cm)
Temperature Range: 0 degrees C to 70 degrees C (32 to 158 degrees F)
Supply Voltage: +10 to 30 VDC @ 95 mA maximum
Data Rates: up to 115.2 kbps
Connectors: DB9 female for RS-232. Terminal blocks for RS-422/485 and power
Isolation: 2000 VAC optical isolation of data signals and ground
Surge Suppression: 7.5, bi-directional avalanche breakdown device. 500W peak power dissipation. Clamping time <1 pico second (theoretical)

T232485 Schematic



Model TTUSB485 USN to 485 Introduction

Supporting 2-wire RS-485 or a 4-wire RS-422/485 communications, this device is well suited for any application that requires long range or multi-drop capabilities. The TTUSB485 model uses pluggable terminal blocks on the RS-422/485 side and has a pair of LEDs that indicate data being transmitted or received. Model TTUSB485 includes special circuitry that adds 2000 volts isolation protection against ground loops and voltage spikes; and it draws power from the USB port so no power supplies is required.

Simply plug the converter into an available USB port on your computer or USB hub and the device will show up as an additional COM port in the Windows Device Manager. Configured as an additional COM port, the converter is now compatible with your Windows applications.

Universal Serial Bus (USB) has become the connectivity workhorse of today's PCs, replacing the familiar serial ports. But many commercial and industrial devices still use RS-422/485 interfaces. To connect these devices to modern PCs you need robust and reliable conversion solutions. At the same time, USB ports are becoming more common on commercial and industrial equipment such as point-of-sale peripherals, medical devices, scientific instrumentation, laboratory equipment and other devices. Sometimes these are used in environments where surges, spikes and ground loops are likely to occur.

Features

- 2000 V RMS optical isolation
- 15kV EDS surge protection
- Adds a COM port to your PC
- Protects against surges, spikes and ground loops
- LEDs for transmit and receive lines
- USB 1.0, 1.1 and 2.0 compatible (12 Mbps)
- Automatic configuration on Windows 98, ME, 2000, XP, Vista
- No power supply required (powered from USB bus)
- Includes 1 meter USB cable

RS-485 Control

No special software is required to control the RS-485 receiver or transmit line driver. The driver is automatically enabled during each byte transmitted in RS-485 mode. The transmitter is always enabled in RS-422 mode. The receiver is tri-stated during each byte transmitted in the echo-off mode. The receiver is always enabled in the echo-on mode. There are 4.7k Ohm pull-down resistors on the RDA and RDB lines. A termination resistor may be added to R16 if needed.

Dip Switch Set-up

Dip switches allow the module to be configured for two-wire or four-wire, RS-422 or RS-485 modes. In two-wire mode the TDA (-) and RDA (-) are tied together and so are TDB (+) and RDB (+), making multi-dropping this converter into an existing network easy.

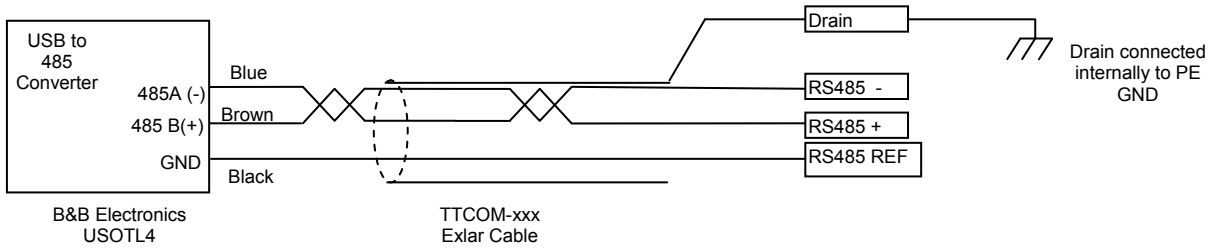
Dip Switch set-up for Tritex

Dip Switch Set-up	
Switch	**ON**
One	TD only enabled during data transmission. **(TD 485)**
Two	RD disabled during data transmission **(ECHO OFF)**
Three	Two-wire mode **(2-Wire)**
Four	Two-wire mode **(2-Wire)**

Specifications:

Dimensions: 3.5 x 1.7 x 0.8 in (8.9 x 4.3 x 2.1 cm)
Temperature Range: 0 to 70 degrees C (32 to 158 degrees F)
RS-422/485 Baud Rate: Up to 460.8 kbps
RS-422/485 Connector: Pluggable (removable) terminal blocks
USB Baud Rate: 12 Mbps
USB Connector: USB type-B female
USB Power: Low power device (draws < 100mA)
Operating System: Windows 98/SE, 2000, ME, XP, Vista
Accessories: Driver CD, USB Cable
Isolation: 2000 V RMS (excludes model USPTL4)
Surge Protection: 15KV ESD

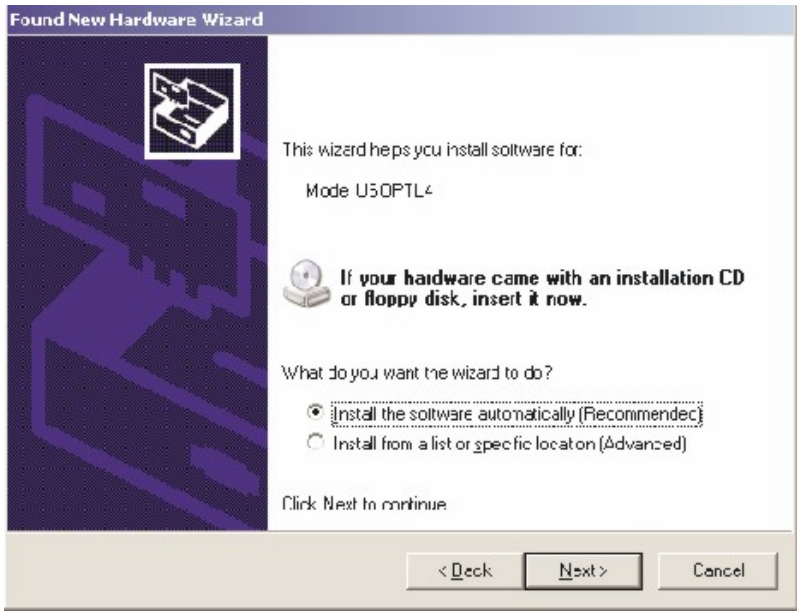
Tritex Wiring



Installation for Windows

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission)
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue
< Back
Next >
Cancel

1. Plug the TTUSB485 into an available USB port on your computer or connected hub. The screen above appears, telling you that there is a new device plugged into the USB bus. Click on *No, not this time*, then the **Next>** button.


Found New Hardware Wizard
This wizard helps you install software for:
Mode USOPTL4
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue
< Back
Next >
Cancel

2. The screen above appears. Make sure *Install the software automatically* is selected. Then select the **Next>** button.

3. The screen above will appear. Click the **Finish** button to complete the installation.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission)
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

4. You will also need to continue to install the serial port the same as installing the converter. Click the **Next** button followed by the **Finish** button. It will take a couple seconds for the serial port to be installed.

Shunt Regulator

TTSR1 Shunt Regulator Option

Transient over voltage problems are quickly solved using shunt regulators that clamp regeneration voltage to safe levels. These simple devices can increase system reliability by stabilizing voltage fluctuations and eliminate over-voltage shutdowns.

The purpose of a shunt regulator is to 'burn off' excess regeneration energy that is produced when a drive brings a large load to a stop. Mechanical braking systems use friction to stop a load and convert kinetic energy into heat. Servo drives on the other hand are very efficient power converters - typically over 98%! They convert electrical energy from the motor to the power supply just as efficiently as when they convert energy from the power supply to the motor. During a rapid deceleration or the deceleration of a large load, enough excess energy can be transferred to shut down the drive or damage the power supply.

A shunt regulator 'clamps' the power supply voltage to a set level and prevents unexpected shutdown or damage. It monitors the power supply voltage and if the voltage exceeds the set limit, the shunt regulator 'bleeds off' the extra voltage through a power resistor. The shunt regulator is only active when the voltage exceeds the set level; otherwise, no current passes through the power resistor. The shunt regulator automatically turns the power resistor on and off as necessary to regulate the voltage, sometimes up to several hundred Hertz.

Description

The TTSR1 shunt regulator is designed to work with four quadrant regenerative servo amplifiers.. During braking most of the stored mechanical energy is fed back into the power supply, which charges the output capacitor to a higher voltage. If the charge reaches the amplifier's over-voltage shutdown point, motor control and braking will cease. To ensure smooth braking of large inertial loads with use of a shunt regulator is recommended. Verify the need for a shunt regulator by operating the servo under the worst case braking condition. If the amplifier shuts off due to over-voltage (blinking red LED) a shunt regulator is necessary (typically during downward move or deceleration).

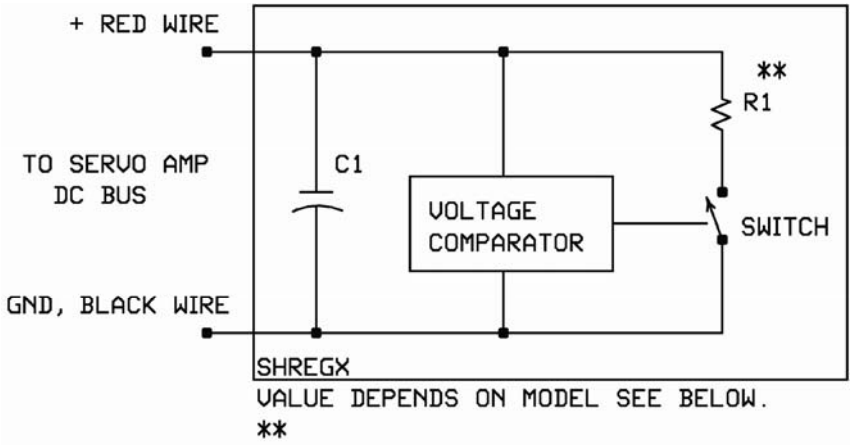
Operation

When the DC bus reaches the shunt voltage of ~ 75 Volts the voltage comparator unit turns on the electronic switch, which connects the R1 power resistor across the DC bus. This power resistor dissipates the energy from the DC bus. After the bus voltage is reduced to less than the shunt voltage setting the resistor is disconnected from the bus. A small hysteresis loop allows time between switching. If the voltage goes above 85V the Tritex will trip on a High Bus Voltage fault and disable the drive. See Faults section.

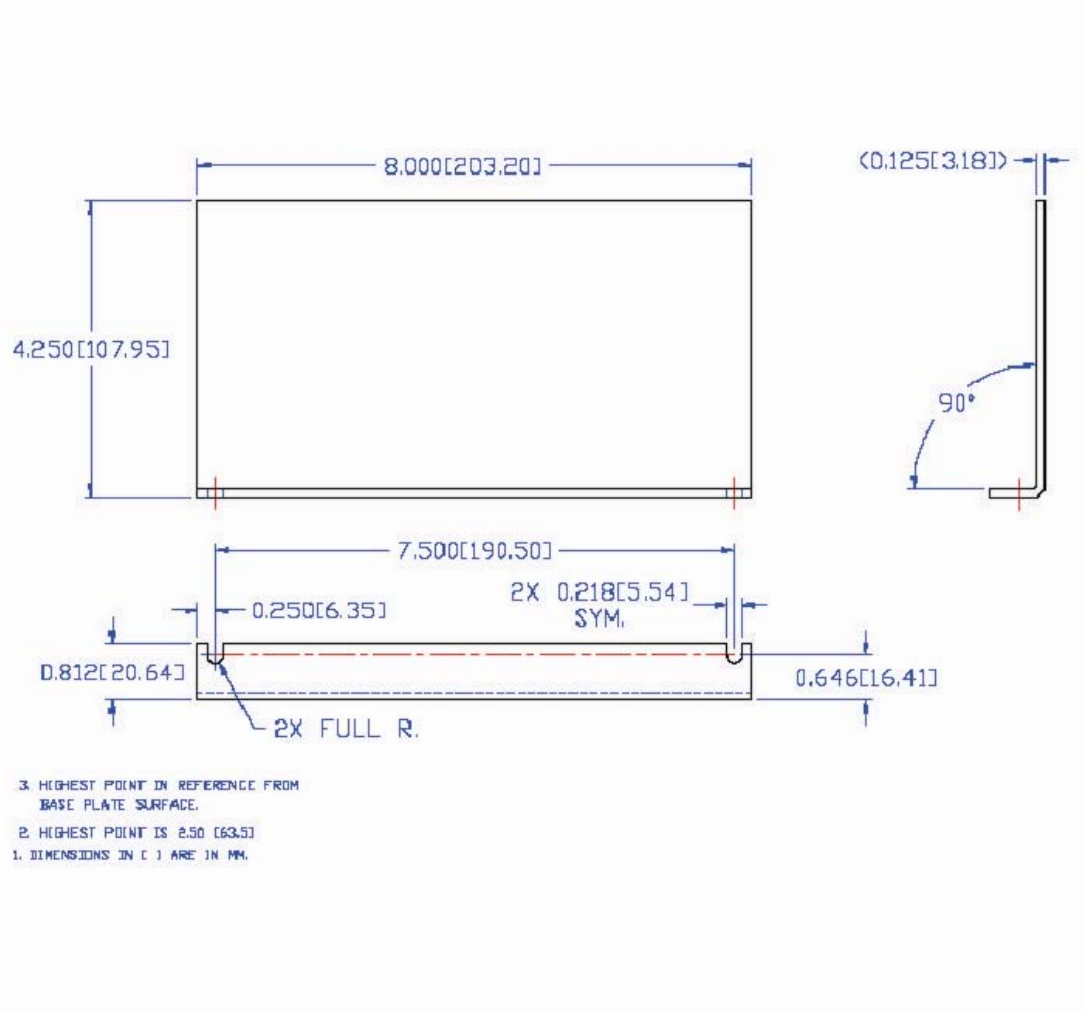
Specifications

Fuse: 3A motor delay rated @ 250 VAC
Filter Capacitance: 1200 µF
Dissipation Capabilities: 95W
Resistance: 5 Ohms
Size: 8.00 x 4.25 x 2.63 inches (203.2 x 108.0 x 66.7 mm)
Weight: .32 lbs (.14 kg)

Wiring Detail



TTSR1 Dimensions



EFT/B & Surge Filter

37263 EFT/B & Surge Filter Introduction

Electrical Fast Transient/Burst (EFT/B) and Surge disturbances are caused by a number of events including switching inductive loads, relay contact bounce, power system switching activity or faults, nearby lightning strikes, etc. The effect of these disturbances can range from temporary service interruption to permanent failure of equipment that is not sufficiently protected.

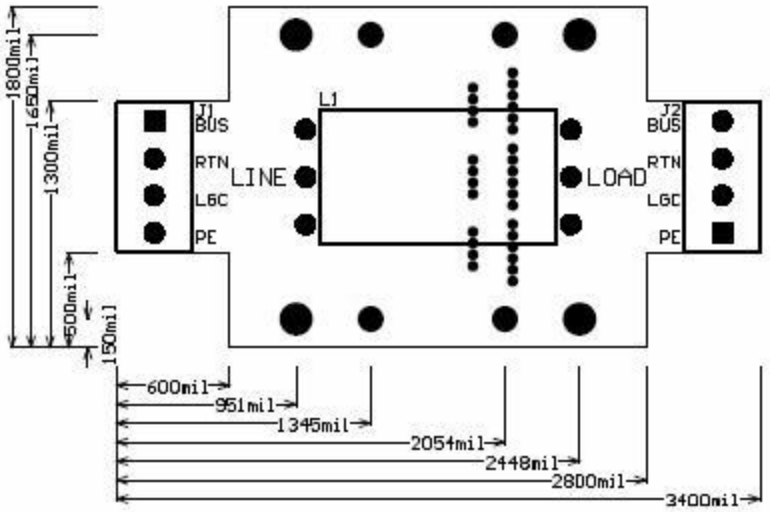
37263 EFT/B & Surge Filter Features

- Designed for use with Tritex Linear and Rotary Actuators
- Place in series with power cable as close as possible to disturbance source
- Provides EFT/B and Surge disturbance immunity to IEC/EN 61800-3:2004-08 Second Environment (Industrial) levels
- 35mm top hat DIN rail mountable using Wago 209-188 mounting feet (not provided)

37263 EFT/B & Surge Filter Specifications

Voltage:	150V Maximum
Current:	15A Maximum
Temperature Range:	-40 to 85°C
Size (L x W x H):	3.4” x 1.8” x 0.8”
Weight:	50 g Maximum
Connections:	12-30 AWG Input (LINE) and Output (LOAD) Terminal Block Connections for Bus Power (BUS), Logic Power (LGC), Power Common (RTN), and PE

37263 EFT/B & Surge Filter Dimensions



Declaration of Conformity

Declaration of Conformity

Manufacturer's Name: Exlar Corporation

Manufacturer's Address: 18400 West 77th Street
Chanhassen, MN 55317
USA

declares, that the product:

Product Name: TLM, RTM, RTG Series Actuators
(Complete Model Listing Below)

Models: **TLM20, TLM30,**
RTM060, RTM090,
RTG060, RTG090

to which this declaration relates, **meets the essential health and safety requirements** and is in conformity with the relevant EU Directives listed below:

EU EMC Directive 2004/108/EC

using the relevant section of the following EU standards and other normative documents:

EMC: IEC/EN 61800-3: 2004 — Adjustable Speed Electrical Power Drive Systems – Part 3: EMC Requirements and Specific Test Methods

Note 1: The above products operate at less then 75 VDC and thus are not subject to the requirements of the Low Voltage Directive.

August 4th, 2008
Date of Issue

John Wiegers
Director of Electrical Engineering

European Contact:

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